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CANADA AGRICULTURE

FALL 74
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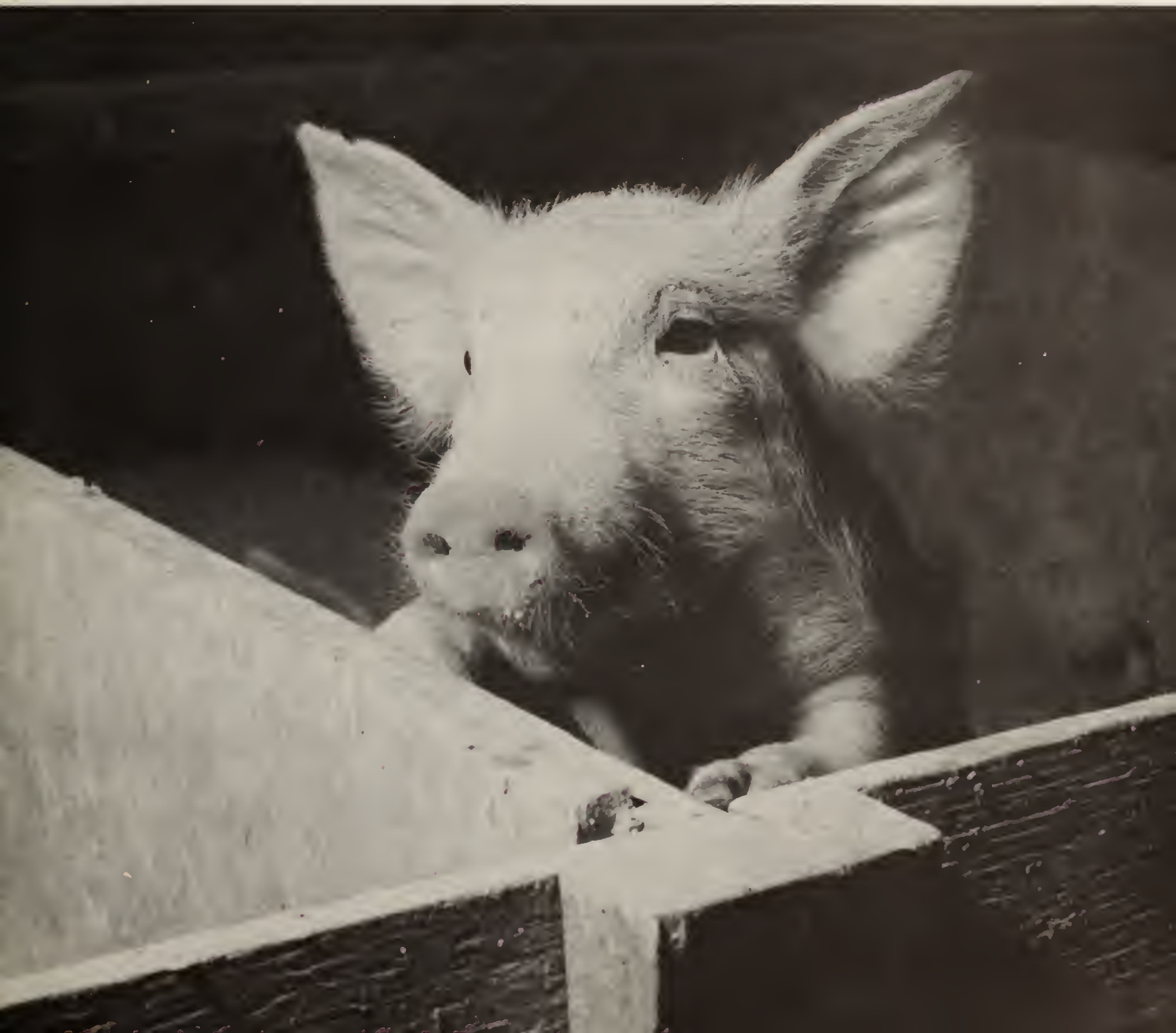
This curious little Yorkshire is just one of the pigs in a comprehensive breeding program involving 2,800 litters at the Lennoxville Research Station. See story page 11

Ce petit Yorkshire curieux est un des rejetons des 2800 mises-bas d'un programme de sélection génétique à la Station de recherche de Lennoxville. Voir article page 11.



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EFFLUENT IRRIGATION AGRICULTURE

J. B. BOLE

Les chercheurs de la Station de recherche de Lethbridge font actuellement des travaux sur l'irrigation d'eaux usées à Taber (Alberta) où a été construit, en 1971, un système d'irrigation des eaux usées. Ils ont constaté que les substances nutritives en solution dans ces eaux éliminent ou réduisent énormément la nécessité d'engrais sur le sol, augmentant ainsi nos ressources naturelles disponibles. Utilisé convenablement, le système sol-plantes peut s'avérer meilleur pour éliminer les eaux usées que n'importe quel système jamais conçu par l'homme.

Although the disposal of waste water on agricultural land dates from ancient times, the practice is again in vogue. For years, man has disposed of sewage effluent, either treated or untreated, into rivers and bodies of water. We now realize our water resources are too valuable to pollute them with disease-causing organisms, nutrients that encourage the growth of algae and aquatic weeds, and organic matter that reduces the level of the dissolved oxygen that is necessary for all aquatic life.

Dr. Bole is a plant nutritionist in the Soil Science Section, CDA Research Station, Lethbridge, Alberta.

Sewage treatment plants represent a large capital investment, and small towns are extremely interested in reducing the cost. One way is to use the effluent for irrigation. This is an inexpensive method of sewage-effluent disposal and, now that there is a strong demand for agricultural produce, land improvement and increased production are important bonuses. The nutrients dissolved in the effluent, instead of accelerating the natural process of eutrophication in water, can greatly reduce or eliminate the need for fertilizer on land, thus extending our supply of natural resources.

The Research Station at Lethbridge has been involved in effluent irrigation research since 1971, when the town of Taber, Alberta, established an effluent irrigation system with the cooperation of the Water Resources Division of the Alberta Department of Agriculture.

Raw sewage is pumped 8 km (5 miles) from the town, then flows through two anaerobic tanks before entering a 16 ha (40 ac) lagoon. This large lagoon allows 1.4 million m^3 (300 million gal.) of effluent to be stored during the 7 months when irrigation is difficult or impossible. It also increases the retention time of the effluent to permit complete microbial digestion of the solids, reduce the population of disease-causing organisms, and reduce the N content of the effluent.

Sewage effluent from the town of Taber, Alberta is used to irrigate 130 ha (320 ac) of alfalfa.

Sewage effluent is disposed of on research forage plots at Taber, Alberta, with a solid-set irrigation system.

Effluent is then pumped 800 m (½ mile) and sprayed on forage, using four 400 m (¼ mile) wheel-move units. Native *Stipa-Bouteloua* grassland was irrigated until recently, but alfalfa is now established on the 130 ha (320 ac) of sandy soil used for effluent disposal.

The Research Station experiment consists of 16 forage plots with five forage species and a control strip in each plot. Sewage effluent is applied with a solid-set irrigation system. Volume of effluent applied and the rate of N and P fertilizer varied, since the objective was to study optimum management for forage production and to establish application limits beyond which the soil and environment will be endangered. The climate is hot and dry (30-35 cm (12-14 in) annual precipitation), and the soil is sandy with an infiltration capacity of 5 cm/hr (2 in/hr). Thus, we are able to apply levels of effluent in excess of those that are considered practical. The 82 and 164 cm/yr (32 and 64 in/yr) of effluent that was applied was considerably more than the amount the town applied. On a field scale, these rates would have raised the water table and not been manageable.

Wells 6 m (20 ft) deep were drilled, lined with plastic, and sealed with concrete. Groundwater and effluent samples were analysed for appropriate cations and anions. Total and fecal bacteria counts were determined by the Provincial Laboratory of Public Health.

The yields of the five forage species (alfalfa, reed canarygrass, altai wild ryegrass, bromegrass, and tall wheatgrass) were similar although the alfalfa took up more N than any of the grasses. Yields were increased when N fertilizer was applied with 82 cm/yr (32 in/yr) of effluent, and a further increase was obtained when effluent was applied at 164 cm/yr (64 in/yr), largely because of the N it contained (Table 1). Yields of 8 to 9 t/ha (3.2 to 3.6 ton/ac) were obtained compared with negligible yields from the non-irrigated native grassland.

Most of the additional 56 kg/ha (50 lb/ac) fertilizer N was taken up at the low effluent level while only half of the additional N was absorbed at the 164 cm (64 in) effluent level. No buildup of nitrates in the soil or leaching of nitrates or other anions in the water table was noted. More than 200 kg/ha (180 lb/ac) of N was absorbed by the forage. If most of the N is in the ammonium form, as was the case in this study, effluent can be applied to a healthy forage crop at a rate that would deliver 200 kg/ha

TABLE 1 ANNUAL FORAGE YIELD AND N UPTAKE AS A FUNCTION OF FERTILIZER N AND P AND EFFLUENT LEVEL

Effluent		Fertilizer N-P		Forage yield		N uptake	
(cm/yr)	(in/yr)	(kg/ha)	(lb/ac)	(kg TDM/ha)	(lb TDM/ac)	(kg/ha)	(lb/a
82	32 in	0-0	0-0	6559	5859	158	141
		56-56	50-50	7968	7118	201	179
164	64 in	0-0	0-0	9133	8159	230	205
		56-56	50-50	9388	8387	256	228

(180 lb/ac) of N before N leaching becomes a concern. Denitrification would also contribute to N losses. The Taber effluent contained from 10 to 30 ppm N. At the average N content (20 ppm), 100 cm (39 in) effluent would be needed to exceed the N uptake capacity of the forage. This effluent level would exceed the practical application level on most soils.

Many environmentalists have expressed concern about phosphates as pollutants. Phosphates, however, are retained in the surface 15 cm (6 in) of soil. Although the 4-6 ppm P applied in the effluent has exceeded plant uptake on our plots and the soil P level is increasing, plant growth has not been adversely affected and phosphates are not contributing to water pollution.

Micronutrients, especially boron and heavy metals, could reach toxic levels in the soil or plant material if industrial effluent with high concentrations of these ions were applied. Analysis of the effluent from Taber shows that it does not contain dangerous concentrations of any of these elements. Fecal bacteria, which are present in the effluent, have not been found on samples of the forage or in groundwater taken from the site.

The soil-plant system, when properly managed, has the capacity to act as a more complete sewage disposal system than any devised by man. When coupled with an anaerobic lagoon to degrade most solid wastes and reduce N compounds to ammonia or gaseous nitrogen, the system is extremely efficient. The soil biosystem can degrade and oxidize extremely complex organic molecules and release or incorporate the resulting CO_2, H_2O, SO_2, and oxides of nitrogen. Anaerobic conditions occurring in soil microsites or at the water table can reduce other ions such as nitrates.

Much of the applied N, P, and K will be taken up by plants and removed in the harvested plant material. Heavy metals will normally be precipitated as sulfates or chlorides in the lagoon. The remaining metals are rapidly fixed in the soil, and only limited amounts are taken up by the plants.

Odors are a serious problem near anaerobic lagoons. However, once effluent enters the soil the problem is eliminated.

Effluent irrigation returns waste water to the groundwater in a purified form and in the process helps combat both our food and fertilizer shortages.

The system appears to be working well at Taber, due in part to the cooperation of officials from the town of Taber and provincial and federal departments of Environment and Agriculture. However, effluent irrigation systems could not be developed everywhere. Studies must first determine that the soil structure and chemistry are suitable, that they will not be adversely affected by the effluent, and that the effluent does not contain levels of toxic substances that exceed the capacity of the soil biosystem to degrade them. ■

Research forage plot containing five forage species and a control strip.

Native non-irrigated species contrasts with bromegrass grown under irrigation with sewage effluent.

CANADA'S FEED GRAIN POLICY

Canada's agricultural industry has been searching for a new and better national feed grains policy for many years. In August, 1973, the federal government announced a set of proposals and gave the industry almost a year to discuss those ideas and suggest alternatives or changes.

The government has now completed its considerations and formulated the new policy which was implemented on August 1, 1974.

The New Policy

The new national feed grains policy now in effect has several features which will help to develop a strong Canadian livestock and feed grain industry.

- Western farmers will continue to have the right to sell their grain to the Canadian Wheat Board. In addition, they will have the choice to sell to any farmer, feedmill or local elevator in Canada at whatever price the buyer and seller agree to. The Canadian Livestock Feed Board will supervise the handling of feed grain moving from the west. Cash advance limits for farmers in the west will be increased from $6,000 to $15,000 and a new program of cash advances will be made available elsewhere in Canada.
- The Canadian Livestock Feed Board and the Wheat Board will ensure adequate supplies of feed grain in storage for the domestic market. A special reserve stock of feed grains will be held at Thunder Bay. Initially, the roll-over stock of feed grains for the domestic market in reserve at Thunder Bay will be 10 million bu.

The federal government will also pay up to $40 million a year to develop a storage program for up to 160 million bu of feed grain. Additional grain stor-

POLITIQUE CANADIENNE POUR LES PROVENDES

L'agriculture canadienne est depuis de nombreuses années, à la recherche d'une meilleure politique nationale des céréales fourragères. En août 1973, le gouvernement fédéral a présenté un nombre de propositions, donnant à la profession presque un an pour les étudier et proposer des modifications ou d'autres solutions.

Le gouvernement a terminé la phase des délibérations et a exposé la nouvelle politique entrée en vigueur le 1er août 1974.

Nouvelle politique

La nouvelle politique sur les provendes comporte plusieurs points qui permettront d'asseoir sur des bases solides et dynamiques l'élevage et la production de céréales fourragères.

- Les céréaliculteurs de l'Ouest conserveront le droit de vendre leurs céréales à la Commission canadienne du blé. En plus, ils ont le choix de vendre à n'importe quel agriculteur, meunerie ou silo régional au Canada, au prix sur lequel, acheteurs et vendeurs se sont entendus. L'Office canadien des provendes exercera un contrôle sur la manutention et le transport des céréales de l'Ouest. La limite des paiements anticipés aux agriculteurs de l'Ouest passe de $6,000 à $15,000 et un nouveau système de paiements anticipés sera établi pour le reste du Canada.
- L'Office des provendes et la Commission du blé feront le nécessaire pour stocker suffisamment de provendes pour le marché intérieur. Une réserve spéciale de céréales fourragères sera entreposée à Thunder Bay. Pour commencer la campagne céréalière 1974-1975, dix millions de boisseaux (3,6 millions d'hl) seront mis en réserve roulante à Thunder Bay pour le marché intérieur agricole.

Le gouvernement fédéral versera aussi jusqu'à $40 millions par an pour la création d'un programme de stockage de céréales fourragères d'une capacité pouvant aller jusqu'à 160 millions de boisseaux (57,6 millions d'hl). On construira des silos supplémentaires lorsque le besoin s'en fera sentir afin d'assurer des approvisionnements suffisants pour la production de viande et l'exportation.

- Tous les agriculteurs auront directement accès à toutes les céréales fourragères de l'ensemble du Ca-

age facilities will be developed when needed to ensure adequate supplies of grain for livestock production and export.

- All farmers will have direct access to all feed grains in all parts of Canada. Prices will be established by supply and demand as buyers are free to buy anywhere in Canada and sellers have the opportunity to find the best price for their crops anywhere in Canada.
- A feed grain price guarantee program will be introduced. Producers will continue to have guaranteed initial prices for all feed grains sold to the Canadian Wheat Board. In addition, a guarantee on feed grain sales to the domestic non-Board market will also be developed.
- Coordination of transportation and stocks to meet domestic and export requirements will continue to be handled by the Canadian Wheat Board. The Wheat Board will issue quotas for delivery of grain (both Board and non-Board) to elevators, and to schedule trains and ships. The Canadian Livestock Feed Board will supervise feed grain brokers and handlers to keep track of the movement of non-Board feed grains from western Canada.
- The Canadian Wheat Board will continue to pool its purchases of feed grain, pay initial prices, set quotas and make final payments on feed grain bought and sold by it. It will have exclusive control of the export market for all wheat, barley and oats, and will also be free to sell feed grain in Canada at competitive prices.

The Canadian Wheat Board will also be able to set quotas on delivery of non-Board domestic feed grains to country elevators if necessary to ensure orderly domestic and export movement.

- A comprehensive nationwide information system will be introduced for the domestic feed grain market. Details on prices paid for feed grains across Canada will be included in the information system. ■

nada. Les prix seront déterminés par l'offre et la demande; les acheteurs pourront s'approvisionner n'importe où au Canada et de leur côté les vendeurs auront toute liberté d'obtenir le meilleur prix sur l'ensemble du marché.

- On présentera un nouveau programme de prix garantis. Les producteurs bénéficieront toujours de prix initiaux garantis pour toutes les céréales fourragères vendues à la Commission canadienne du blé. En outre, il y aura aussi une autre garantie pour les ventes de céréales fourragères hors-Commission sur le marché intérieur.
- La Commission continuera de coordonner les transports et les stocks pour satisfaire aux exigences de la consommation intérieure et de l'exportation. Elle continuera aussi à établir les contingents de livraison des céréales (vendues par elle et autrement) aux silos, aux trains et navires réguliers. L'Office canadien des provendes exercera un contrôle sur les courtiers en grains et les manutentionnaires, de façon à connaître les ventes de céréales fourragères sur le marché libre en provenance de l'Ouest.
- La Commission poursuivra la mise en commun de ses achats, les versements de prix initiaux, l'établissement de contingent et le réglement final des céréales fourragères qu'elle aura achetées et vendues. Elle conserve le contrôle exclusif du marché d'exportation pour tout le blé, l'orge et l'avoine, et peut aussi vendre des céréales fourragères au Canada, à des prix ou à des niveaux concurrentiels avec ceux du maïs.

Elle peut, le cas échéant, établir des contingents pour les céréales de production intérieure vendues directement aux silos régionaux afin de régulariser les ventes intérieures et les exportations.

- On prévoit la mise en place d'un système d'information à l'échelle nationale pour le marché intérieur de céréales fourragères qui donnera des détails sur les prix payés dans l'ensemble du Canada. ■

GREATER ACTIVITY AT THE FAIRGROUNDS

L. JAMES

Le Programme agricole de prêts aux expositions aide les sociétés agricoles à améliorer les installations d'exposition et à mettre sur pied diverses activités communautaires. Ce programme a été élaboré pour rendre plus viables les expositions agricoles et améliorer les moyens d'existence des populations rurales. La Société agricole de Stratford est l'une des 22 expositions et foires agricoles au pays qui a reçu l'aide lui permettant d'organiser des activités telles que le Congrès du porc de l'Ontario.

Mmm pork! That was the reaction of some 7,000 visitors to the Stratford Agricultural Society's fairgrounds in June when the hog industry sponsored Ontario's first Pork Congress.

And that's the way it was supposed to be. Agricultural shows today are planned to reach the consumer, as well as the producer. The theme was on pork as a food, not just the finer points of production. Visitors to Stratford learned that an agricultural group can stage a sophisticated show of interest to consumers, and create a better understanding for agriculture at the same time.

Lois James is an editor-writer, Periodical Services Unit, Information Division, CDA, Ottawa

This poster drew visitors' attention to information on nutrition.

The federal Agricultural Exhibition Loans Program has played a role in helping agricultural societies improve their public relations, and building facilities to stage larger events in recent years.

People Prefer Pork

The Stratford Agricultural Society is just one of 22 agricultural exhibitions and fairs in Canada that have received assistance. At Stratford, a federal loan has made it possible for the society to accommodate provincial shows, such as the Ontario Pork Congress.

All segments of the industry were represented at the 3-day congress. While producers watched the judging and sale of breeding stock and market pigs, farm wives and urban folk were tempted with the theme "people prefer pork". The consumer program included displays of sausage making, snack recipes, information on nutrition and handicrafts. There was a professional touch about the preparation of pork dishes, including barbecued pork, and a pigskin fashion show that delighted the public. Consumers, viewing the agribusiness displays, received an insight into the complexities of producing that mouthwatering pork chop.

The modern multi-purpose building proved ideal for the congress. Four hundred spectators relaxed in the show and sale ring area while viewing the activities. The Market Annex, which is the home of the Stratford Farmers' Market, was used for a weanling seminar and dining during the congress.

Fulfilling a Need

Stratford is nestled in the center of prime Ontario farmland where farmers are particularly noted for hog production. The city boasts some of the best fairground facilities in Ontario for events such as the Ontario Pork Congress. Several years ago, the enterprising Stratford Agricultural Society saw the need for additional facilities to serve the rural and urban population. In 1960 they built the Agricultural Coliseum with the assistance of a $43,000 Agriculture Canada grant for the annual fair and other events. Since the Coliseum was built, it has been transformed into a skating arena, and a hall for off-season activities such as the congress.

With Stratford becoming increasingly important as an agricultural center, the need for additional facilities became evident. In 1972, a livestock pavilion and agricultural community center were built adjoining the coliseum with the help of a $230,000 loan from Agriculture Canada under the Agricultural Exhibition Loans Program. These two new buildings have over 37,000 sq. ft. of space. The Agricultural Community Center is used year-round for roller skating, as well as various meetings, banquets, dances and other social functions.

A demonstration on pork cuts tempted consumers with the theme "people prefer pork".

The Ontario Pork Congress is one of several hundred activities that the Stratford Agricultural Society will accommodate this year. In addition to the annual fair put on by the Society, agricultural organizations and community service groups use the four acres of buildings for a variety of activities such as cattle shows and sales, horse rodeos, various charitable functions, bingos, dances, and home and garden shows. The facilities have added a new dimension for such groups as 4-H and senior citizens, who use the building free of charge.

The Stratford Agricultural Society feels that agriculture has an important contribution to make to Ontario and that the facilities they provide will improve their community and agriculture.

Agricultural Exhibition Loans Program

In 1971, Agriculture Canada introduced the Agricultural Exhibition Loans Program to provide agricultural societies with long-term loans for the construction of multi-purpose buildings to improve agricultural exhibition facilities and provide accommodation for a variety of community activities. The program was designed to make agricultural exhibitions more viable and to improve the livelihood of rural people and the quality of rural life. Loans are made for up to 30 years and cover up to 90 percent of the approved capital cost of the project.

The program is administered by the Livestock Division, Production and Marketing Branch. A committee of department personnel reviews each application on the basis of need and the ability of the agricultural association or society to repay the loan.

Until 1962, Agriculture Canada made grants to listed fairs and exhibitions of up to 50 percent of the cost of construction of buildings. Each building received an agricultural assessment depending on the use of the building for agricultural purposes. The Agricultural Coliseum at Stratford was built under this program. The program was dropped because many of the facilities were utilized only during fair time and for storage during the winter months. The loans program now in effect ensures that buildings will be used throughout the year for the benefit of the community. ■

D. W. MacDONALD

Early settlement in Quebec followed the wide navigable rivers that were the main lines of communication at that time. The St. Lawrence plain provided opportunities for those who wanted to make their living on the land. Later, settlers had to look farther inland, and many were attracted by the hills that extended into the southeastern corner of the province from the mountains to the south.

In spite of the more difficult terrain, the Eastern Townships of Quebec became a productive agricultural area. The easily worked loam, and sandy loam soils received above average rainfall, because of the higher elevations. Records now show that close to 4 in. of rain falls every month during the growing season, giving almost uninterrupted growth throughout the summer.

Once, farmers were largely self-sufficient. They grew a variety of cereals, forages, fruits and vegetables. They raised cattle, hogs and chickens. If one enterprise failed, there was another to fall back on.

Mr. MacDonald is Head, Periodical Services Unit, CDA Information Division, Ottawa.

D. W. MacDONALD

Les premiers colons arrivés au Québec s'établirent sur les bords des grandes rivières navigables qui étaient alors les principales voies de communication. La plaine du St-Laurent offrait ses richesses à ceux qui voulaient vivre de la terre. Plus tard, les colons ont dû pénétrer davantage à l'intérieur des terres et bon nombre d'entre eux ont été attirés par les collines de la région du sud-est de la province qui prolongent les montagnes du sud.

En dépit des difficultés topographiques, les Cantons de l'est sont devenus une région agricole productive. Les terres franches et sablo-limoneuses se travaillaient bien et, en raison de l'altitude plus élevée, bénéficiaient de précipitations supérieures à la moyenne. Les précipitations mensuelles s'élèvent à près de 4 po (10 cm) pendant la période de croissance ce qui favorise une croissance presque ininterrompue au cours de l'été.

Au début, les agriculteurs vivaient en grande partie en autarcie. Ils produisaient une grande variété

M. MacDonald est chef de la Sous-section des services de périodiques de la Division de l'information (Ottawa).

Sixty years ago, farming in the Eastern Townships was undoubtedly a rewarding experience, in spite of the hard work involved. But there were problems related to the geography of the region and farmers looked to agricultural specialists for help. The Canada Department of Agriculture responded in 1914 by establishing an experimental farm at Lennoxville, Que. The Station is celebrating sixty years of research and experimentation into soil, crop and livestock production. In that time the staff has demonstrated the potential of the area. Farmers have not always found it possible to fully develop their resources, but they have a better knowledge of good farming principles in hill country as a result of investigation at Lennoxville.

Variability of soil, and the rolling topography have precluded large scale field operations with heavy equipment. Because they are less dependant on annual seeding, it has been easier to grow forages than cereals and special crops. And livestock have been able to harvest forages in areas not accessible to harvest equipment.

More Concentrated Feed

Cattle have utilized the feed resources in the form of pasture, hay or grass silage. The search continues at Lennoxville for higher energy, more concentrated

Lennoxville has modern facilities for investigating crop storage and cattle feeding systems.

de cultures céréalières et fourragères, de fruits et de légumes. Ils élevaient des bestiaux, des porcs et des poulets. Si une spéculation échouait, on se rattrapait sur une autre.

Il y a soixante ans, l'agriculture des Cantons de l'est était sans aucun doute une expérience rémunératrice malgré le travail pénible qu'elle exigeait. Il existait des problèmes propres à la géographie de la région et les agriculteurs avaient besoin de l'aide de spécialistes agricoles. C'est en réponse à cette demande, que le ministère de l'Agriculture du Canada fondait en 1914 une ferme expérimentale à Lennoxville. La Station célèbre cette année son soixantième anniversaire de recherches et d'expérimentation sur les sols, les cultures et l'élevage. Au cours de cette période, le personnel a établi les possibilités de la région. Les agriculteurs n'ont pas toujours pu développer entièrement leurs ressources, mais les recherches de la station de Lennoxville leur ont donné une meilleure connaissance des principes d'exploitation agricole en collines.

La variabilité du sol et la topographie vallonnée interdisent les cultures à grande échelle et l'emploi de matériel lourd. Comme les espèces employées ne doivent pas être semées chaque année, il a été plus facile de produire des cultures fourragères que des céréales et des cultures spéciales. De plus, on s'est servi du bétail pour récolter les fourrages dans les régions non accessibles au matériel de récolte.

Aliments plus concentrés

Le pâturage, le foin et l'ensilage d'herbe constituent les ressources alimentaires de base du bétail. Des recherches visant à mettre au point des aliments plus concentrés et à forte teneur énergétique se poursuivent à Lennoxville afin de permettre aux producteurs de la région de concurrencer davantage ceux qui disposent de céréales ou d'ensilage de maïs à forte teneur énergétique. «La Station de recherche, souligne le directeur Camille Bernard, a mis l'accent sur des systèmes visant à accroître le rendement des bestiaux par l'amélioration de la production et de la manutention des cultures fourragères et à améliorer les aptitudes du bétail par les croisements.»

La Station dispose d'un vaste complexe de bâtiments d'élevage comprenant deux étables pour vaches laitières, quatre pour bovins de boucherie, une bergerie, quatre porcheries et dix silos-tours. La superficie totale de la Station est de 1100 acres dont 800 sont cultivées (444 et 333 ha).

Selon le Dr Bernard, le programme de recherches fait l'objet d'une constante mise à jour en vue d'assurer que les problèmes prioritaires reçoivent l'attention qu'ils méritent. La recherche se fait de concert avec les services provinciaux de vulgarisation qui

La station de Lennoxville possède des installations modernes pour l'étude de l'entreposage des récoltes et les installations pour l'alimentation des bestiaux.

Dairy-beef crosses make good use of grassland resources.

Les croisements bovins laitiers-bovins de boucherie font bon usage des pâturages naturels.

feeds to make local producers more competitive with those having supplies of high energy grains or corn silage. The main thrust at the Research Station, the Director Dr. Camille Bernard points out, has been on systems to improve livestock performance through improved production and handling of feed crops, and increased potential of livestock through crossbreeding.

The Station has a large livestock establishment. Two dairy barns, four beef barns, one sheep barn, four piggeries and ten tower silos provide shelter for feeding. There are 1,100 acres at the Station, 800 of which are under cultivation.

The research program is under continuing review to ensure that high priority problems receive proper attention, says Dr. Bernard. Research is also carried on in cooperation with provincial extension services which apply the results at the farm level.

Experience at Lennoxville has proved that the generally low acidity and fertility of the loam and sandy loam soils can be corrected, and high rates of production achieved. As a rule, under natural rainfall, farmers can expect 1 acre to support one cow throughout the summer, producing 8,000 lb of milk. Two and a half acres are required to produce all the feed (pasture, hay, silage, grain) for one milking cow over the year.

Steers normally gain 300 lb during the season, grazing at one and a half animals/ac. Under good management, steers have gained up to 500 lb on pasture in one season. Pastures have a capacity for 20 ewes/ac early in the season, or an average of six/ac for the whole season.

Ladino Country

Ladino clover—timothy mixtures generally produce the highest pasture yields, and remain productive for 4 or 5 years under good management. Alfalfa is the choice for hay and silage on well drained sites. However, frost heaving takes its toll and this

sont chargés de l'application des résultats auprès des producteurs.

Des expériences effectuées à Lennoxville ont permis de démontrer qu'il est possible de corriger l'acidité et la fertilité généralement faible des sols loameux et sablo-loameux et d'en tirer des rendements élevés. Si la pluviosité est normale, on peut prévoir qu'en général une acre suffira à une vache productrice de 8000 lb (3624 kg/0,404 ha ou 8955 kg/ha) de lait au cours de l'été. Il faut toutefois compter deux acres et demi (1 ha) pour la production de tous les aliments (pâturage, foin, ensilage, céréales) nécessaires à une vache pendant toute l'année.

Les bouvillons font normalement des gains de 300 lb (136 kg) au cours de la période estivale, le taux de charge des pâturages étant d'un animal et demi par acre (3,7 animaux/ha). Une bonne gestion a permis à des bouvillons en pâturage de gagner jusqu'à 500 lb (226 kg) au cours de cette période. En début de saison, le taux de charge des pâturages peut s'élever à 20 brebis par acre (49/ha), la moyenne s'établissant à 6 brebis (15/ha) pour l'ensemble de la saison.

Le pays du trèfle ladino

Les rendements d'herbage les plus élevés sont généralement obtenus avec les mélanges de trèfle ladino et de fléole, qui judicieusement exploités, continuent de produire pendant 4 ou 5 ans. Pour la production de foin et d'ensilage dans des champs bien drainés, la luzerne est toute indiquée. Toutefois, le déchaussement par la gelée cause de grands dégâts et c'est une des préoccupations premières des chercheurs de Lennoxville qui travaillent en collaboration avec ceux de la Station de recherche de Ste-Foy (Qué.).

On cultive le maïs fourrager de façon restreinte dans les vallées, mais aux altitudes plus élevées, il produit moins à long terme, que les mélanges de graminées-légumineuses.

La Station de Lennoxville a été l'une des premières au Canada à encourager l'utilisation des silos ho-

problem is receiving priority at Lennoxville, in collaboration with the CDA Research Station at Ste-Foy, Que.

Corn is grown to a limited extent in the valleys for fodder, but it has disadvantages compared to grass-legume mixtures at higher elevations over the long term.

Lennoxville was one of the first research stations in Canada to promote use of horizontal silos for grass silage. Bunker silos still provide inexpensive storage for feed but field crop scientists at Lennoxville are asking themselves whether the sides on bunker silos are really necessary? Can grass silage be stored cheaper with less spoilage in plastic sheets, sealed to exclude air. This is a question that Lennoxville expects to answer in a very short time.

Soil specialists at Lennoxville have had an opportunity to study a wide variety of soils in relation to acidity and fertility. It has been slow, painstaking work because of the complexity of conditions, but they are in a position now to understand and explain the management of soils in this hilly region, and other parts of Quebec.

Beef production in Quebec is largely a by-product of dairy farms. Dairy-men are showing interest in recently imported beef breeds by mating cows not selected for dairy replacements to beef bulls by means of artificial insemination. As a result, they are supplying substantial numbers of dairy-beef crossbred heifers on contract to beef cattle breeders in Canada and the United States. There are few records of the performance and reproductive traits of such crossbreds and Lennoxville has undertaken a comprehensive study of crossbreds from Holstein and Ayrshire cows bred to Hereford, Charolais, Limousin and Maine-Anjou bulls. With more precise information on performance, beef production can be increased in Quebec.

Sheep Breeding

A few specialists in sheep production have been successful on the forage resources of southeastern Quebec. Their numbers are small, much less than the demand for lamb would appear to indicate. Dr. Bernard, who takes a special interest in sheep, is hopeful for expansion but the sheep population appears to be doing no more than holding its own.

In the meantime, the station is not neglecting sheep. The Director believes that year round sheep breeding is essential for profitable lamb production and a program is under way at Lennoxville to breed this capability into the sheep by selecting replacement rams and ewes born in October and November.

A population of 800 crossbred ewes with ½ Dorset, ¼ Leicester and ¼ Suffolk breeding was established at Lennoxville and moved to La Pocatière Experimental Farm for testing. They are exposed to rams from June to October. Each year the earliest born ewe lambs are kept to replace the latest lamb

rizontaux pour la conservation de l'ensilage d'herbe. Les silos-fosses sont un moyen économique d'entreposage des aliments; mais on se demande maintenant si les parois latérales des silos-fosses sont réellement nécessaires. Le coût de l'entreposage de l'ensilage d'herbe peut-il être abaissé, avec moins de pertes, si l'on utilise des feuilles de plastique étanches? Les chercheurs de Lennoxville espèrent répondre à cette question très bientôt.

Les pédologues de Lennoxville ont pu étudier le niveau d'activité et de fertilité d'une grande variété de sol. Ce travail a été lent et laborieux en raison de la complexité des conditions; ils sont toutefois maintenant en mesure de comprendre et d'expliquer la gestion des sols de cette région montagneuse et d'autre parties du Québec.

La production de boeuf au Québec est dans une grande mesure un à-côté de la production du lait. Les producteurs laitiers s'intéressent actuellement aux races à viande récemment importées en accouplant par insémination artificielle à des taureaux de boucherie les vaches non retenues pour la production laitière. En conséquence, ils fournissent par contrat un nombre substantiel de génisses, issues de croisements entre des types laitiers et de boucherie, aux éleveurs de bovins de boucherie au Canada et aux États-Unis. Il existe peu de données sur le rendement et les caractères reproducteurs de ces croisés, et la Station de Lennoxville a entrepris des recherches approfondies sur les croisés issus de vaches Holstein et Ayrshire fécondées par des taureaux Hereford, Charolais, Limousin et Maine-Anjou. De meilleures connaissances sur le rendement permettraient d'accroître la production de boeuf au Québec.

Reproduction du mouton

Quelques spécialistes de la production ovine ont pu utiliser avec succès les ressources en fourrage du sud-est du Québec. Ces éleveurs sont rares, beaucoup trop rares, si l'on se base sur la demande d'agneaux. M. Bernard, qui s'intéresse tout particulièrement au mouton, est confiant de l'augmentation du cheptel, qui toutefois ne réussit tout au plus qu'à se maintenir.

La Station n'en oublie pas pour autant le mouton. Le Directeur croit que l'agnelage réparti sur toute l'année est essentiel à une production rentable d'agneaux, et un programme est en cours à Lennoxville en vue de transmettre génétiquement cette aptitude au mouton par une sélection des béliers et des brebis de remplacement nés en octobre et en novembre.

A Lennoxville, on a établi un cheptel de 800 brebis croisées ½ Dorset, ¼ Leicester et ¼ Suffolk, qu'on a transporté à la ferme expérimentale de La Pocatière pour fins d'essais. Les brebis sont mises à la lutte de juin à octobre. Chaque année, on garde les agneaux nés des premiers agnelages pour remplacer les brebis qui ont agnelé à la fin de la saison. Les béliers utilisés sont également ceux qui provien-

This pen demonstrates the range of the swine crossbreeding program.

bing ewes. Also, the rams used are the twin ram lambs born at the start of the lambing season. Hopefully, the result will be a line of sheep which, under natural conditions, will breed and conceive regardless of season.

Swine Breeding

While research at Lennoxville usually applies to local conditions, it also has important implications across the country. For instance, one of the most comprehensive breeding programs attempted with hogs, involving about 2,800 litters, has just been completed.

Boars and sows of eight breeds (Yorkshire, Landrace, Lacombe, Hampshire, Duroc, Berkshire, Large Black and Tamworth) were mated to produce 28 different two-breed crosses. Crossbred females were evaluated for reproductive performance and crossbred males for market value. It was concluded from this stage of the program that crossbred sows from Landrace-Yorkshire, Hampshire-Landrace and Large Black-Lacombe matings demonstrated the best litter performance; and crossbred males from the white breds (Yorkshire, Landrace, Lacombe) crossed with the Hampshire and Duroc breeds produced the best carcasses.

Gilts of the six best two-breed crosses have since been mated with five breeds of boars selected on the basis of high market value of their progeny. The pigs produced were tested for their feed efficiency and carcass quality.

Final results of this experiment carried out in collaboration with Laval University, Macdonald College, Kemptville College of Agricultural Technology and the CDA Experimental Farm, Nappan, N.S., will be released shortly and will be of great interest to swine breeders everywhere.

Over the years, cattle have emerged as the key to viable farming systems in the Eastern Townships of Quebec. Soil, plant and animal scientists at Lennoxville have forged many of the links in the production chain. They take some satisfaction from the fact that their research and experimentation into livestock feeding and breeding systems have helped farmers stay on the land, in competition with farmers in more specialized areas of production. ■

Tout l'éventail du programme de croisement est ici représenté.

nent des agneaux jumeaux nés au début de la saison d'agnelage. On espère aboutir à la création d'une lignée de moutons qui, dans des conditions naturelles, pourront se reproduire en toute saison.

Reproduction du porc

Même si les recherches de Lennoxville s'appliquent généralement aux conditions locales, certaines ont une portée nationale. Ainsi, l'un des programmes les plus complets d'amélioration du porc, comprenant environ 2800 portées vient à peine de se terminer.

On a accouplé des verrats et des truies de huit races (Yorkshire, Landrace, Lacombe, Hampshire, Duroc, Berkshire, Large Black et Tamworth) pour produire 28 hybrides différents. On a évalué les femelles croisées à l'égard de la performance à la reproduction et les mâles croisés, à l'égard de la valeur marchande. On a conclu, à partir de cette phase du programme, que les truies croisées issues des accouplements Landrace-Yorkshire, Hampshire-Landrace et Large Black-Lacombe, avaient démontré la meilleure prolificité; en outre, les mâles croisés issus des croisements entre les races à robe blanche (Yorkshire, Landrace et Lacombe) et les races Hampshire et Duroc, ont produit les meilleures carcasses.

De jeunes truies des six meilleurs hybrides ont, depuis, été croisées avec cinq races de verrats sélectionnés pour la haute valeur marchande de leur descendance. Les porcs issus de ces croisements ont été évalués pour l'indice de consommation et la qualité de la carcasse.

Les résultats définitifs de ces essais, réalisés en collaboration avec l'université Laval, le collège Macdonald, le collège de technologie agricole de Kemptville et la ferme expérimentale du ministère fédéral de l'Agriculture à Nappan (N.-É.), seront publiés prochainement et devraient intéresser vivement tous les éleveurs de porc.

Au fil des ans, les bovins sont apparus comme la clé de la rentabilité des systèmes d'exploitation agricole des Cantons de l'est du Québec. Les pédologues, phytotechniciens et zootechniciens ont contribué à forger plusieurs chaînons de la chaîne de production. Ils peuvent s'enorgueillir quelque peu du fait que leurs recherches et leurs expérimentations en alimentation du bétail et sur les systèmes d'élevage ont aidé les agriculteurs à demeurer dans leur ferme, en concurrence avec les agriculteurs des secteurs de production plus spécialisés. ■

HOG STABILIZATION PLAN

STABILISATION DU PRIX DES PORCS

The interim national hog stabilization plan introduced last spring represents a new concept in agricultural stabilization. The value added concept, as it is known, is used to stabilize returns to producers of a major commodity while not interfering with market prices. It allows the market to follow its normal course based on supply and demand, and at the same time, it gives producers an effective guarantee that their returns on labour and equity capital will be maintained at reasonable levels. Producers retain full responsibility for their own decisions which will enable them to maintain a viable operation.

In the long-term, the program allows for production to meet both domestic and new export markets. Compared with price stabilization formulas, value added plans are better able to cope with rapid changes in input costs. A guaranteed price today may be inadequate tomorrow because of the rapidly rising costs of one or more inputs.

The Current Plan

Hog producers are guaranteed a national average margin of $22.41 per hundredweight between the

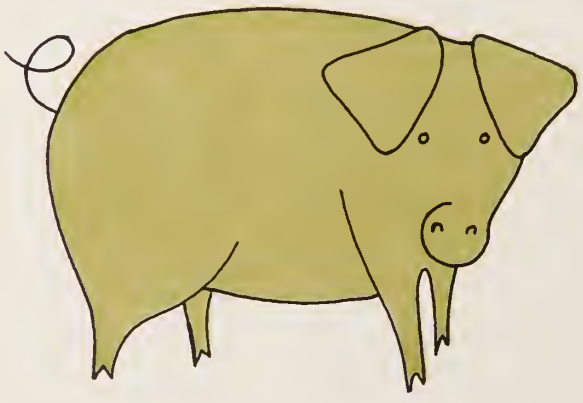
Le programme national temporaire de stabilisation des prix du porc, récemment entré en vigueur s'appuie sur un nouveau concept de stabilisation des prix en agriculture.

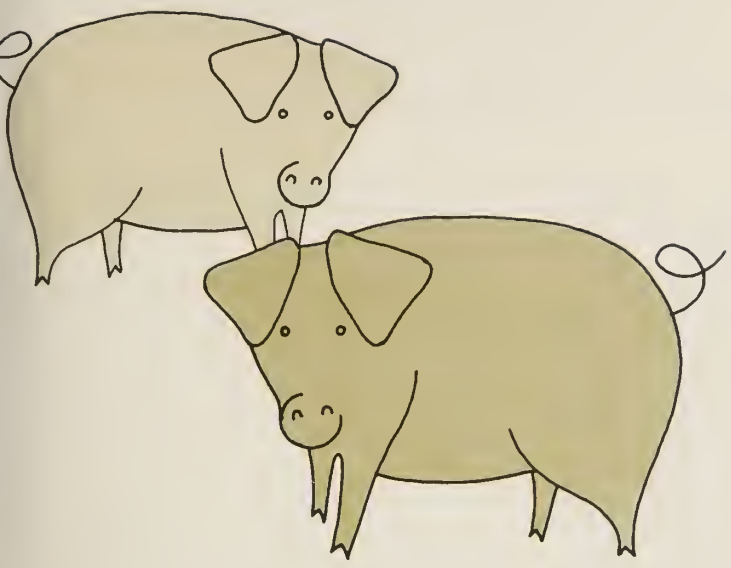
Ce concept, appelé à juste titre principe de la valeur ajoutée, laisse le marché suivre son cours normal fondé sur le jeu de l'offre et de la demande. D'autre part, il fournit aux producteurs une garantie réelle que leur revenu pour leur travail et leur mise de fonds sera maintenue à des niveaux raisonnables. Les producteurs, de leur côté, conservent l'entière responsabilité quant aux décisions à prendre pour maintenir une exploitation viable.

Le programme de la valeur ajoutée permet aux prix du marché d'atteindre leurs propres niveaux. La responsabilité du producteur n'en est pas pour autant amoindrie, car c'est à lui de suivre l'évolution du marché afin de s'assurer un revenu décent.

A long terme, il permet une expansion ordonnée de la production pour faire face aux nouveaux marchés tant intérieurs qu'extérieurs.

En comparaison des formules de stabilisation des prix, les programmes de la valeur ajoutée permettent





wholesale cost of feed grain and hog prices on a national basis. The plan covers all hogs marketed between April 1, 1974 and March 31, 1975, that index 88 or better under the federal hog grading program. Any farm can claim up to a maximum of 1,500 hogs.

Stated differently, the program offers two guarantees. First, there is a 100 percent guarantee on the cost of feed, based on the amount of feed needed to bring a hog from 50 lb to market weight. Second, there is a 90 percent guarantee on all other costs, including profit margins, again based on the previous 5-year average.

Next April, the federal government will determine the difference between average hog prices and feed costs required to bring a pig from 50 lb to market weight. A national average price for the year April 1974 through March 1975 will be calculated by weighting the monthly price of hogs by hog slaughter in each month and in each region. If the actual margin between prices and feed costs is less than the guaranteed margin of $22.41 per hundredweight, producers will be paid the difference, up to 1,500 hogs per farmer indexing 88 or better.

Payments are made on a one-year period in keeping with the program's intent as a stop-loss measure to prevent long-term losses caused by factors beyond the hog industry's control and against producer's long-term interests.

The government intends to amend the Agricultural Stabilization Act, under which this program operates, to permit more flexibility in incorporating input costs in stabilization programs. The hog program is a new concept in stabilization and the experience gained with it will permit the design of improved long-run stabilization plans.

To assist farmers in their decision-making, in late August the Livestock and Meat Trade Report began publishing the weekly calculations on ''margin'' for hogs (difference between hog prices and feed costs). ■

de mieux faire face aux brusques changements des coûts de production. Un prix garanti aujourd'hui peut accuser un recul par rapport à celui de demain en raison de l'augmentation rapide de l'un ou l'autre des coûts de production.

Le programme fournit une assurance contre les modifications importantes de la marge bénéficiaire nationale qui autrement rendraient la production instable.

Plan courant

Il garantit d'abord aux producteurs de porcs une marge de $22.41 les 100 livres entre le prix des porcs et celui de leurs aliments. Seule la marge bénéficiaire est stabilisée, et il n'y a aucune intervention dans la fixation des prix des aliments et du porc.

Le programme couvre tous les porcs d'indice 88 ou plus, selon le programme fédéral de classement du porc, commercialisés entre le 1er avril 1974 et le 31 mars 1975, jusqu'à concurrence de 1,500 porcs par producteur.

En d'autres termes, le plan offre deux garanties:

La première est que le coût des provendes sera couvert à 100% pour la quantité nécessaire à engraisser un porc de 50 lb jusqu'au poids marchand. La deuxième est que tous les autres coûts, y compris la marge de profit sont couverts à 90%, suivant la moyenne des cinq années précédentes.

Le 1er avril prochain, le gouvernement fédéral déterminera la différence entre le prix moyen des porcs à travers le Canada et le coût de gros des aliments requis pour amener un porc de 50 livres au poids du marché.

La marge moyenne nationale sur les douze mois, d'avril 1974 à mars 1975, sera calculée en pondérant les moyennes des prix mensuels par les abattages mensuels de porcs d'indice 88 ou supérieur de chaque région. Si le montant est inférieur à celui de la marge garantie de $22.41 les cent livres, les producteurs recevront un versement représentant la différence sur la totalité de leurs ventes jusqu'à 1500 porcs par producteurs. Ainsi, les différences régionales et individuelles des coûts et de l'efficacité de la production des porcs ne sera pas modifiée.

La loi sur la stabilisation des prix agricoles qui administre ce programme sera amendée l'année prochaine afin d'apporter plus de souplesse et d'adjoindre les coûts de production aux programmes de stabilisation. Le programme de stabilisation du prix des porcs est un concept nouveau qui permettra, grâce à l'expérience acquise, à améliorer les programmes de stabilisation à long terme.

Dans le but d'aider les producteurs à prendre des décisions judicieuses, La Revue du marché des bestiaux a commencé à la fin d'août à publier les calculs des «marges» pour les porcs selon le présent programme. ■

ECHOES
FROM THE FIELD AND LAB

SEED SUNFLOWERS EARLY
Sunflowers must be seeded early to obtain the maximum yield observes Dr. Henry Enns, research scientist, CDA Research Station, Morden, Manitoba. Seed trials with Peredovik (late maturing) and Krasnodarets (early maturing) indicate that yield loss of Peredovik can be over 50 percent when seeded in mid-June rather than mid-May. For the same delay, the reduction in yield of Krasnodarets is only about 40 percent. Therefore, Peredovik should not be seeded later than the end of May, says Dr. Enns.

Since the percentage of oil in the seed drops drastically in late-seeded crops, Krasnodarets should be used for late seeding. Sunflower oil is the most valuable portion of the crop.

Dr. Enns notes that days to bloom and days to mature in different varieties are not constant. Days to maturity in both varieties differed by over 3 weeks depending on seeding date. In late-seeded material the time from blooming to maturity decreased more than the time required to bloom. This fact, no doubt, causes the reduced yield, lower oil content and lower bushel weight.

SOURCES PROTÉIQUES POUR LE BÉTAIL Alors que de nos jours, les protéines destinées à l'alimentation du bétail, non seulement augmentent de prix mais sont menacées de pénuries, la publication 1515 apporte une aide précieuse à qui veut obtenir le meilleur rendement possible avec les moyens du bord. Organisée selon le type d'élevage, porcins-volaille et ruminants les sources protéiques sont examinées suivant leurs valeurs, leurs désavantages et leur coût.

Les protéines, bien que facteurs important dans l'alimentation, ne sont pas pour cela le seul élément à considérer. Les autres aspects, reliés aux sources de protéines, sont aussi discutés et expliqués.

Certaines sources de protéines peuvent être cultivées à la ferme, au bénéfice de l'exploitant.

MEASURING AIR FLOW IN GRAIN A new method of measuring small airflow velocities within the interkernel spaces of stored grain has been developed by Ben Berck, a research scientist at the Winnipeg Research Station. Airflow velocity in the grain microclimate as low as 1/10,000th of a mile/hr has been determined. While of only 20 bu amounts of wheat and other cereal grains have been tested to date, the method is expected to work equally well in a 10,000 bu lot. Mr. Berck notes that each bushel of grain normally has over 1 million kernels so that a 10,000 bu lot would have 10 billion grain kernels, each offering flow resistance.

Mr. Berck has found that if the grain temperature is uniform throughout the bin, the upward and downward airspeeds are much the same. However, he noted that in practice there can be updraft or downdraft depending on the temperature differences at the top and bottom of the bin.

The new method uses an inert, non-toxic gas as a micrometeorological tracer. Mr. Berck foresees a wide range of possible applications of this method such as the determination of rate of translocation of obnoxious odors from livestock manure and the movement of volatile substances like insecticides and fungicide vapors.

ÉLEVAGE DU POULET À GRILLER Le poulet à griller fait l'objet de la publication 1509 d'Agriculture Canada. Préparée d'abord dans les Maritimes mais maintenant publiée par le fédéral, cette publication traite aussi bien des facteurs de commercialisation permettant de déterminer la faisabilité de l'entreprise que les facteurs particuliers tels que les paramètres de construction indispensable à un élevage sain. Il est bien évident que tous les aspects de l'alimentation, croissance et prévention des maladies sont traités dans cette publication succinte mais complète. Ce n'est pas un traité mais un ouvrage que tous agriculteurs, amateurs ou professionnels devraient avoir en main.

Avec un peu d'ingénuité l'aviculteur pourra construire lui-même nombreuses des installations proposées. Les illustrations apportent beaucoup à la compréhension du texte.

FEEDING POTATO WASTE The waste products from processed potatoes are an excellent source of energy for ruminant animals. A new publication entitled ''Guidelines for Feeding Potato Processing Wastes and Culls to Cattle'', by J. W. G. Nicholson, Fredericton Research Station, is based on extensive research at the Fredericton and Charlottetown Research Stations.

The nature of processing wastes and the problems in handling processing waste on the farm is described in the publication. A section on the nutritional value of potato products notes that when high levels of potato material are fed, a supplement fortified with protein, minerals and vitamins A and D is needed. In addition, some roughage must be fed with potato wastes to maintain normal rumen function. The problems that may be encountered in feeding potatoes include choking, glycoalkaloids, pesticide residues, and high levels of cooking fat.

To obtain this review on feeding potato wastes, request Publication 1527, 1974, from: Information Division, Agriculture Canada, Ottawa, K1A 0C7.

SOIL DRAINAGE Tile drainage systems should not be installed in areas of heavy clay soils without closely studying the permeability of the soil, recommends Christian de Kimpe, head of the soils section, Ste-Foy Research Station. For his study, Dr. de Kimpe

ECHOS
DES LABOS ET D'AILLEURS

selected a clay soil area which seemed to have potential for tile drainage. The bedrock was at least 4 feet below the surface throughout the area. The test site was slightly inclined with a few undulations and depressions.

Measures of water depth in the soil, aeration and frost penetration were taken at intervals for more than one year along the gradual slope. Dr. de Kimpe found that, while water levels were at a depth of 4 feet and more at the higher test points on the incline, towards the bottom of the slope the water was within 20 inches of the surface.

Dr. de Kimpe concludes that the high water level in the soil at the lower test points accelerated decomposition within the soil which clogged the air and water passages. He notes that in clay soils with low permeability any human intervention, like tile drainage or cultivation, will further slow the waterflow through the soil.

NEW VEGETABLE JUICE FROM CELERY Scientists at the Summerland Research Station have found that adding the plasma fraction from celery tops to tomato juice at a level of 20 percent gives a pleasant celery flavor with no objectionable bitterness. Samples of this vegetable juice were submitted for outside appraisal.

The celery flavor was entrapped in dextrin by distilling the plasma fraction into the condensate during concentration in a flash evaporator. After dehydration and storage of the dextrin-flavor substance for 6 weeks at room temperature, the scientists obtained a good celery flavor when it was reconstituted with water. More extensive experiments with a commercially available dextrin are planned by the Summerland Research Station.

SUCCESSFUL INTEGRATED MITE CONTROL After 8 years on the integrated mite control program, scientists at the Summerland Research Station have found that biological control of mites in commercial orchards has been successful. They have examined seven of the 10 integrated mite control orchards in B.C. In all of the orchards, they found a good balance of apple rust mite, European red mite, and predaceous phytoseiid mites. In some orchards the stigmaed, *Zetzellia mali* was also present.

It has not been necessary to use summer season mite sprays since 1966 when the integrated mite control program started. Generally. pre-bloom sprays of dormant oil have been used to control European red mite, but in two of the orchards even this has not been necessary for the past 2 years.

One of the objects of this survey was to determine if any different species of phytoseiid mites had built up in the orchards. Only *Typhlodromus occidentalis*, the original phytoseiid, and *Z. Mali* were found.

FARMERS' MARKETS ON THE RISE Farmers Markets in Alberta are increasing in popularity reports CDA Production and Marketing officials in Edmonton. Eight farmers markets opened in Alberta last spring and will remain open until late fall with the possibility of some being open during the winter months. A wide variety of products are offered for sale such as vegetables, fruit, bedding plants, eggs, chicken, preserves, baked goods, handicrafts and antiques.

For the first time, a portable display booth travelled to farmers' markets, shopping malls, fairs and rodeos throughout the province, to provide information on farmers' markets. It was sponsored by the Alberta Department of Agriculture and distributed information on nutrition, the uses of products commonly sold at farmers' markets and recipes.

HORMONE INSECTICIDE Scientists at the Lethbridge Research Station are using the insects own hormones as insecticides in the latest search for a safe and effective method of insect control. The hormones which an insect's body produces are vital to the development of an insect and by changing its hormone balance, scientists can destroy an insect with minimal effect to the environment.

According to J. A. Shemanchuk, an entomologist at the station, hormones are part of an insect's body chemistry and it is unlikely that it can develop a resistance to this type of insecticide. In laboratory tests, one part of a hormone added to a million parts of water was all it took to kill mosquito larvae. Mr. Shemanchuk's research has involved several different hormones. One hormone prevents an adult mosquito from shedding its pupal skin, while another interferes with molting in the larval stage and is also fatal.

One disadvantage with hormonal insecticides is that they may affect some non-pest insects, notes Mr Shemanchuk. Control of insects by hormones is still in the experimental stage and will not be applied commercially for several years.

EN SOL GELÉ Dans les études sur la survie des plantes au froid de l'hiver, l'une des principales difficultés est le prélèvement de racines de plantes dans des sols gelés. Une solution à ce problème a été trouvée par MM. R Paquin et H. Pelletier de la Station de recherches de Ste-Foy. Ils utilisent une scie à chaîne dont les dents sont renforcées de soudure afin de lui donner plus de mordant et de résistance.

Après avoir repéré les rangs, on marque l'emplacement avec un gabarit pour ne pas endommager les racines.

Dans l'argile, le limon et le sable, la scie fait sa coupe comme si c'était dans le bois. Il faut à peine quelques minutes pour prélever deux mottes qui fournissent un échantillon. Les mottes sont prélevées à la bêche.

Si dans un sol non gelé, la lame de la scie réussit à contourner ou à écarter les petites pierres, il n'en va pas de même dans un sol gelé et il faut alors déplacer le trait de coupe.

Les mottes de sol sont placées par groupe de deux dans une boîte. Une fois dans la serre, les vides entre les mottes et les parois de la boîte sont comblés avec du terreau afin d'éviter l'affaissement lors du dégel. Si les plantes sont encore vivantes, les bourgeons ne tardent pas à éclater. Quelques semaines plus tard, on peut observer la vigueur de la repousse et déterminer le pourcentage de la survie en comptant le nombre de plantes vivants et celui des morts.

Un article de 'taille' sur ce sujet sera publié dans une revue scientifique canadienne.

Coupe des échantillons avec la scie à chaîne. Vue d'un échantillon de sol prélevé à St-Vallier, le 11 février 1974. Le sol était gelé à une profondeur de 5 à 6 pouces (13 à 15 cm).

EXCELLENT EATING PEARS FROM SCA STORAGE

F. R. FORSYTH and C. L. LOCKHART

Les conditions de récolte et d'entreposage sont très importantes pour approvisionner le marché en frais de poires de qualité. A la Station de recherche de Kentville, les chercheurs ont constaté qu'une atmosphère auto-controlée permet de conserver les poires sans danger dans des sacs de 2 lb s'ils sont en polyéthylène de 1 mil, hermétiques et entreposés à 30°F. La même atmosphère que celle des petits sacs, peut servir à entreposer les poires dans des chambres à atmosphère contrôlée plus grandes.

''Three thousand years and we still don't know 'em'' was a statement made by the British Farm Produce Council regarding pears. How true this is when we consider the scarcity of well-conditioned, ripe and juicy pears on the Canadian market.

Our research at the Kentville Research Station on the shortage of pears was started because locally grown Clapp Favourite and Bartlett pears have been offered on the fresh fruit market from time to time with only minimal success. The usual complaint about Clapp Favourite was a short storage life while Bartletts often developed internal breakdown of the core area soon after being placed in a ripening temperature of 65°F.

No other fruit is as responsive to harvesting and storage conditions as is the pear. Even for short term storage, pears are picked before they are ripe, but still capable of ripening. For most varieties this means harvesting when their firmness, measured with a mechanical pressure tester, has reached a value characteristic of the variety. Clapp Favourite pears are harvested at 15-16 lb and Bartlett at 19-20 lb firmness in Nova Scotia, while Anjou are harvested in British Columbia at a firmness of 13 lb.

The concept of a cold-chain (i.e. a rigidly controlled temperature regime from the time that the fruit is harvested until it reaches the consumer) is extremely important for quality pears on the fresh market. Any delay in getting the harvested pear from field temperature to 30°F is costly in terms of its storage life. A continuous storage at a temperature of 30°F is optimal for our varieties.

Certain fungal and bacterial diseases must be guarded against in the field and in storage. If the pears are free of blemishes and disease before harvest, they should be sprayed with or dipped in a post-harvest fungicide such as thiabendazole or benomyl before being placed in cold storage at 30°F.

Dr. Forsyth is Head of the Plant Physiology Section and Mr. Lockhart is a research scientist in the Plant Pathology and Pesticide Residue Section, CDA Research Station, Kentville, Nova Scotia.

Clapp Favourite pears show light, medium and severe (left to right) symptoms of carbon dioxide injury.

CA Storage

Controlled atmosphere storage of pears is not widely practiced commercially. The super-sensitivity of certain varieties to carbon dioxide injury could be the main reason. This brown core disorder has been noted in Anjou pears packed in wooden boxes with a polyethylene liner. The gas tightness of the liner allowed the carbon dioxide levels to reach 8 percent. The fact that Clapp Favourite, one of our two main commercial varieties, is very sensitive to both carbon dioxide injury and low oxygen injury made it imperative that we investigate the problem.

Three-bushel samples of Clapp Favourite and Bartlett pears were maintained in rigidly controlled C.A. conditions of either 0 or 2 percent carbon dioxide and 2 percent oxygen. The Clapp Favourite pears showed unacceptable levels of CO_2 injury when even 2 percent CO_2 was present while the Bartletts did not show any injury. On the other hand, the Bartletts were prone to breakdown of the core tissue unless 2 percent carbon dioxide was present.

Subsequently, we were able to maintain Bartlett pears for 195 days at 2 percent CO_2 and 2 percent O_2 with low levels of core breakdown and no carbon dioxide injury. However, the Clapp Favourite pears in 1973 were not satisfactory when stored at 0 percent CO_2 and 2 percent O_2, indicating that low oxygen injury is also a serious problem with this variety.

SCA Storage

In addition to controlled atmosphere storage, there are also modified atmospheres. C.A. involves accurate control of the composition of the atmosphere while modified atmosphere describes the attainment of beneficial atmospheres in rooms or packages by less exact means.

One such method is the use of sealed polyethylene sacs of a defined thickness and fixed ratios of weight of fruit to area of sac surface. This method is called physiologic packaging by its inventor P. Marcellin of CNRS in France. The final atmosphere attained is a self controlled atmosphere (SCA) and is maintained because of an equilibrium reached between the production of CO_2 by the pear and its loss through the plastic, and the uptake of O_2 by the pears and its replenishment by the diffusion of O_2 through the plastic.

Knowing that pears are subject to carbon dioxide injury and low oxygen injury, we used small polyethylene bags of three different thicknesses, 1.0, 1.5 and 2.0 mil, as a means of screening the varieties for their sensitivity to the above physiological disorders. A standard weight of pears (2 lb) was used and the surface area of plastic was regulated by heat-sealing the plastic as close to the fruit as possible.

The pear varieties, Anjou, Aurora, Bartlett, Bosc, Cayuga, Clapp Comice and Flemish Beauty, were

(Upper row) Bartlett pears in 2 mil polyethylene sac 30°F left, 32°F right. (Lower row) Bartlett pears in 1 mil polyethylene sac 30°F left, 32°F right.

tested by this means. All of the varieties showed carbon dioxide injury when stored in 2.0 mil polyethylene bags. For all varieties a thickness of 1.0 mil produced the best results. With long term storage, however, CO_2 injury appeared in some of the varieties stored in 1.0 mil, for example in Aurora after 31 weeks, Anjou 22 weeks, Comice 24 weeks, Bosc 18 weeks and Cayuga 20 weeks. The 1.5 mil did not confer any advantage over the 1.0 mil and of course brought the pears into an atmosphere more closely resembling the damaging atmospheres of the 2.0 mil sacs. Each time that a sac of pears was set to ripen a duplicat sample was analysed for CO_2 and O_2 in the atmosphere of the sac. From this information, two conclusions were reached: (1) 2 lb of pears can safely be stored at 30°F in a sealed 1 mil polyethylene sac; and (2) the same gas atmospheres found to be safe in the small sacs can be used to store pears in larger controlled atmosphere rooms.

TABLE 1 QUALITY OF CLAPP FAVOURITE AND BARTLETT PEARS AFTER 13 AND 12 WEEKS C.A. AT 30°F RESPECTIVELY FOLLOWED BY 2 DAYS RIPENING AT 65°F AND 5 DAYS AT 50°F

C.A.				Core	CO_2	
CO_2	O_2	Variety	Firmness	Browning	Injury	Flavor
%	%		lb	%	%	
0	2	Clapp F.	3	0	1	Good
2	2	Clapp F.	<3	0	15	Good
0	2	Bartlett	4	100	0	Poor
2	2	Bartlett	<3	0	0	Good

The pears kept both at controlled temperature and in C.A. were in line with good cold-chain procedure. However, the period between good storage and consumption by the consumer is the most critical in so far as loss of quality is concerned. Pears taken directly from cold storage at 30°F and set to ripen at a continuous temperature of 70-80°F can soon become dry and tasteless. Flemish Beauty and Anjou conditioned at 55°F for 2 weeks after cold storage or Bartlett and Clapp Favourite maintained for 2 days at 70°F followed by 5 days at 55°F can make the difference between the consumer receiving a tasteless, mushy, dry fruit or a juicy, tasty delight.

For the housewife to obtain the longest life from well-grown, well-stored and conditioned pears, the fruit should be kept at the refrigerator temperature. ■

PRECONDITIONNING IMPROVES POTATO CHIP COLOR

B. B. CHUBEY

Les chercheurs de la station de recherche de Morden étudient les méthodes qui permettraient de régler le rapport entre les sucres et l'amidon dans les pommes de terre entreposées, dans le but d'améliorer la couleur des croustilles. L'exposition des tubercules à une température élevée (70 °F) (21 °C) avant la mise en entrepôt frigorifique (40 à 45 °F) (4 à 7 °C) améliore la couleur. Ce conditionnement a plus d'effet sur les tubercules mûrs et sur les tubercules qui accumulent de faibles réserves de sucres lors de l'entreposage frigorifique.

Color is the most important quality parameter of potato chips. In their manufacture, the reducing sugar content of the potato tuber is closely related to the color of the chips produced during the frying process. Generally, the higher the sugar concentration in the tuber, the darker the color of the fried chips.

Freshly dug potatoes have a low sugar content and result in light-colored chips. Under low temperatures in storage, starch in tubers is hydrolyzed to sugar. This reaction can be reversed by raising the storage temperature.

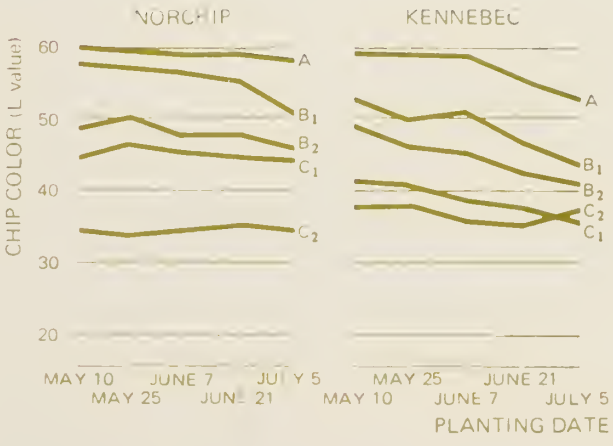
Following harvest, potatoes are normally stored at 42-45°F until required for chipping, then the storage temperature is raised to 70°F. This temperature is maintained for 2 to 4 weeks or until the sugar level is reduced sufficiently to enable production of light-colored chips. This heating process is referred to as reconditioning.

At the Morden Research Station we have been investigating alternate methods of managing the sugar-starch balance in the potato tuber to improve chip color of stored potatoes. Research has shown that potato varieties that accumulate high amounts of sugars in cold storage have a high phosphorylase enzyme activity. It also has been observed that low phosphorylase activity occurs in freshly harvested and reconditioned tubers. This low enzyme activity is thought to be induced by an inhibitor that acts only under these conditions. The premise that it is also activated by high temperatures prompted a study of the effect of high temperatures prior to cold storage on chip color. The concept of holding potatoes at a high post harvest temperature (70°F) prior to cold storage (40-45°F), developed at Morden, has been termed "preconditioning".

Chip color, measured as L values, was determined with a Hunter color and color difference meter. High values indicate light-colored chips. An L value of 45 is considered to be the minimum acceptable color.

The differences between treatments (Figure 1) indicate that chip color is improved by subjecting the tubers to 5 weeks of preconditioning prior to storage at 45 or 40°F. The chipping potential of Norchip was improved to a greater extent than Kennebec. Preconditioning affected Norchip more at 40°F than at 45°F, while the reverse was true for Kennebec. It was also more effective with mature tubers and tubers which inherently accumulate low amounts of sugars in cold storage, such as the variety Norchip.

Preconditioning is an economical technique and is compatible with standard storage methods. Freshly harvested potatoes are still warm from field heat and require only a limited amount of additional warming for preconditioning. In contrast, reconditioning potatoes from cold storage in preparation for chipping requires considerably more heat, particularly in sub-zero weather. On the basis of this study, it is felt that preconditioning would be of considerable benefit to the chipping industry. ■



Chip color of Norchip and Kennebec potatoes of 5 different maturities as affected by preconditioning and storage. Curve A=color at harvest; B_1 and C_1=10 weeks of storage at 45 and 40°F, respectively, after 5 weeks of preconditioning at 70°F; B_2 and C_2=15 weeks of storage at 45 and 40°F, respectively, without preconditioning.

Dr. Chubey is a food quality specialist at the CDA Research Station, Morden, Man.

W. O. HAUFE

Les produits pharmaceutiques et les antiparasitaires modernes ont permis l'élimination presque complète de certains parasites à un coût relativement bas. Cependant, certaines autres conséquences n'ont pas été complètement évaluées. Les recherches entreprises à Lethbridge visent à peser, du point de vue économique, les avantages consécutifs à la désinsectisation de l'animal et la réduction temporaire de la croissance ou du poids entraînée par la toxicité du traitement.

PESTS!

A FACTOR IN THE ECONOMIC PRODUCTIO OF LIVESTOCK

Pests and parasites are an important economic factor in the production of livestock on range and farm pastures. The general principle of animal protection has been to eradicate or exterminate injurious organisms rather than to consider alternative practices to keep parasite populations within limits in economic animal production. The 'eradication principle' achieved great impetus after World War II because highly effective chemical pesticides and drugs provided the means of eliminating pests and parasites with unprecedented success at a low cost. Organization, however, has been generally lacking to actually achieve eradication on a regional basis except for a few arthropod vectors of human disease in some tropical parts of the world. For this reason, a large arsenal of synthetic chemicals and drugs became the basis of preventive pest control practices in which treatments were scheduled as an insurance against infestation and as a routine part of the animal management system.

These routine treatments became the primary target of the 'Ecology Movement', which pointed to indiscriminant use of pesticides as an undesirable source of environmental pollution. As a result of public reaction, stringent regulations are being placed on registered compounds to the extent that many pesticides are either being removed from use or are ceasing to be available to agriculture from the chemical industry. It is certain that commercial development of some new compounds has virtually ceased and many agriculturists are now alarmed that we will not have the means of controlling new epidemics of pests in future years.

A major aim at the Lethbridge Research Station is to evaluate the economic consequences of chemical control methods as well as the effects of pests and parasites on efficiency and levels of production in the livestock industry.

Thresholds

For many years, it was felt that if thresholds, i.e. the minimum size of the infestation causing a mea-

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surable effect, could be established for each specific pest or parasite, then control practices could be applied at a minimum expense. We now know that if thresholds exist in an animal, they are not constant but vary or 'float'. This depends on nutrition, disease, weather, chemical toxicity and management procedures, which interact with the effect of the parasite. Research on horn flies and mosquitoes in animal production systems has shown that productivity of growing beef cattle is influenced in several ways:

- The number of flies tolerated varies widely among animals in the same herd.
- The number of flies tolerated by an animal varies as the level of the investation changes.
- Rate of growth of the most sensitive yearling Hereford heifers on irrigated pasture can be reduced by more than 50 percent of their normal rate of gain during moderate infestations in the summer. The average for cattle with moderate infestations appears to be about 18 to 22 percent when grazing conditions include abundant supply of grass.
- Low rates of growth on poor or inadequate grass may not be affected by infestation until the animal reaches the starvation level. Then, infestations can be the difference between survival and death from nutritional diseases.
- Given time, an animal will adapt to fairly high infestations. Unfortunately, this ability cannot be exploited for cattle in the range situation since the growing period for grass is usually finished by the time that the animals have adapted successfully to the pests and are growing normally again.
- Fortunately, heavy infestations are rare or are of relatively short duration. However, sudden heavy onslaughts of any blood-sucking pest can cause anaphylactic shock which invariably ends quickly with the death of an animal without access to shelter on the range or in a pasture.

Multiple Attack or Infestation

The most complexing aspect of assessing the economic impact of livestock infestations on ranges and pastures is the number of different pests that affect the productivity of the animal at the same time. The attack of different pests, such as mosquitoes, tabanids and other blood-sucking flies, may be confined to certain parts of the day. The over-all effect of infestations, however, is due to the interaction of the combined infestations. For example, the gains in productivity resulting from protecting animals from horn flies is completely eliminated if infestations of mosquitoes are present even for short periods of the day. This indicates that the effects of a number of pests are not arithmetically additive in limiting productivity, but rather that one or more pests may operate by limiting the potential productivity of the animal in the same way.

This is an important feature to be recognized in any animal protection program for a range environment. It demands that for economic returns one

The two top photographs show how untreated cattle huddle in the corners of the field for protection from the pests. Cattle that have been treated with pesticides, below, graze undisturbed throughout the field.

ADDITIONAL DAYS ON FEED AFTER THE COMPENSATORY PERIOD (OCTOBER) REQUIRED BY YEARLING HEIFERS TO MATCH THE WEIGHT OF SIMILAR ANIMALS PROTECTED FROM FLIES WITH DDT TO THE END OF THE FLY PERIOD IN SEPTEMBER

Stress	Treatment	Additional growing days
Stable reduced fly burden with marginal dermal toxicity	DDT spray	Baseline
Weekly removal of flies without chemical toxicity	High-pressure water spray	1
Stable reduced fly burden with moderate toxicity	Coumaphos spray	8
Uncontrolled fly burden	No treatment	15
Uncontrolled fly burden with added toxic stress	Eserine injection[1]	18

[1] Simulates the toxic effect of coumaphos without providing any protection from flies.

INTERACTION OF TEMPERATURE, FLIES AND STRESS OF TREATMENTS ON GROWTH RATE IN UNIFORM YEARLING HEIFERS

Herd treatment	Av. daily gain in weight (20 animals), kg		Significant difference
	28-38 °C[1]	20-28 °C[1]	
Protected:			
DDT	1.42	0.60	Yes
Coumaphos	1.37	0.35	Yes
Unprotected			
Exposure, flies only	0.66	1.11	Yes
With drug stress[2]	0.56	0.66	No
Intermittent relief[3]	0.94	0.86	No

[1] Range of max. daily temp. for consecutive periods of 14 days.
[2] Physostigmine sulphate (eserine).
[3] Weekly physical removal of flies.

EFFECTS OF MODERATE BURDENS OF HORN FLIES AND PROTECTIVE TREATMENTS ON THE GROWTH OF YEARLING HEIFERS

Treatment			Gain as %
Kind	Interval	Av gain / animal / day, kg[1]	of unprotected group
Methoxychlor	1 wk	.932	145
Methoxychlor	3 wk	.900	140
DDT	3 wk	.882	138
Physical reduction	1 wk	.891	139
Unprotected	—	.641	100

[1] 105 days, June 10-September 23, for infestation rates of 200-300 flies / animal.

must have control of the full range of infestations that may affect a farm or ranging unit due to its location and climatic conditions. This finding, more than any other aspect of the host-parasite relationship, indicates that with more complete knowledge from current research programs extensive changes must be made in present management practices to take advantage of the full potential of livestock breeds through more appropriate procedures in animal protection.

Heat and Cold

Interference of pests and parasites with the productivity of an animal depends on extremes in temperature. Economic losses from ectoparasites, such as lice, are most pronounced in range animals during extremely cold weather. Reduced gains from horn flies, on the other hand, are greatest during hot weather. In the first case, the infestation interferes with thermoregulation in cattle. In the second case, high temperatures increase the number of times that a single fly feeds in a day and discomfort from the same number of flies is greatest during hot periods unless the animal has access to shade or shelter.

Pesticides

At the present time, we are entirely dependent on toxic chemicals to reduce or control infestations on animals. While modern pesticides are highly effective in killing pests, they have a disadvantage in terms of economic returns from pest control practices. To some degree, pesticides are toxic to livestock as well as to parasites. Successful use of pesticides depends on knowing the relative toxicities of different products and applying the best chemical to fit the particular situation. There is always a trade-off in economic return between the gains that an animal will make when it is relieved of an infestation and the temporary decrease in growth or gain that is caused by toxicity of the treatment. Consequently, it is extremely important to apply exactly the recommended amount to each animal to control the infestation without producing unnecessary toxicity.

Methoxychlor, for example, is the least toxic chemical for use on cattle followed closely by DDT, which is now banned. The organo-phosphorus compounds such as malathion, coumaphos, ruelene, and dichlorvos are more toxic in terms of production factors although they degrade faster and leave less residue in animal products. Gains from coumaphos treatments are as low as 50 percent per day of those obtained with some other pesticides such as DDT and methoxychlor.

With the proper pesticide, the trade-off between effects of parasitisms and toxicity in animal gain is always in favor of increased returns from elimination of the pest. Gains can also be increased by taking advantage of the environments that reduce the impact of pests and parasites during the peak of the infestation. ■

L. JAMES

Le programme 4-H (au Québec, Cercles de jeunes ruraux), programme national d'éducation destiné à former la jeunesse rurale, compte 78 000 membres appartenant à 5900 cercles 4-H. Il y a plusieurs années, le ministère fédéral de l'Agriculture avait largement contribué à l'établissement de ces cercles au Canada. Si l'application du programme 4-H au Canada ne relève par directement du Ministère, il fournit cependant des ressources humaines et financières considérables nécessaires à la bonne marche du programme.

4-H CLUBS OF CANADA
COMMEMORATING THOSE PERSONS WHOSE FAITH AND INTEREST IN RURAL YOUTH LED TO THE ESTABLISHMENT AT ROLAND IN 1913 OF THE FIRST OF CANADA'S BOYS' AND GIRLS' CLUBS. KNOWN SINCE 1952 AS THE 4-H CLUBS. FIFTY YEARS AFTER THOSE FIRST BEGINNINGS, MEMBERS OF CANADIAN CLUBS, TOGETHER WITH 4-H MEMBERS THROUGHOUT THE WORLD, CONTINUE TO PLEDGE HEAD, HEART, HANDS, AND HEALTH TO THE GREATER SERVICE OF THEIR CLUBS, COMMUNITIES AND COUNTRIES
HISTORIC SITES ADVISORY B
OF MANITOBA
1963

DEVELOPING CANADA'S RURAL YOUTH

4-H (in Quebec, Cercles de Jeunes Ruraux) is a nationwide educational program to develop rural young people to become responsible members of society. With 78,000 members belonging to 5,900 clubs in Canada, 4-H is the largest development program for rural youth.

In keeping with the 4-H motto, members "learn to do by doing." Individual projects permit members to gain knowledge and skills in particular subjects, such as beef, dairy, clothing, foods or field crops. More important, perhaps, are the lessons learned in responsibility and discipline by completing tasks in accordance with a predetermined plan.

The Early Years

Rural youth activities date back to the early 1900's in Canada. A boys' and girls' club, established at Roland, Manitoba in 1913, was the predecessor of the present 4-H program.

The late Dr. James Wilson Robertson, Commissioner of Agriculture and Dairying for Canada, organized a competition for farm youth in 1899. Because of a seed shortage that year, boys and girls were encouraged to collect 100 of the best heads of grain on the family farm. The response was so impressive that $100 prizes were offered to the boy or girl in each province who, by careful selection and cultivation, did the best work with wheat or oats over a 3-year period. This competition was perhaps a forerunner of the 4-H program.

4-H Catches On

The federal and provincial departments of agriculture undertook an extensive promotional campaign in 1921 to encourage the growing of "select" bacon hogs. As a result, 4-H swine clubs sprang up across the country. With club members anxious to compete and produce "select" hogs, their parents became more knowledgeable about the required standards.

In 1922, J. A. Ste-Marie, CDA Experimental Farm, Lennoxville, organized 4-H livestock clubs in the

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Canada's delegates to National 4-H Conference in Washington take pride in representing Canada's 78,000 members.

Individual projects like forestry permit members to "learn to do by doing".

Eastern Townships of Quebec. In 1924, Stephen Boily of the Livestock Division assumed the responsibility for these clubs. By 1954, 10 CDA Livestock Division fieldmen had responsibility for organizing and directing 4-H dairy, beef, sheep and swine clubs in Quebec. That year, however, administration of 4-H livestock clubs in Quebec was transferred to the Quebec Department of Agriculture and Colonization.

From 1924 to 1930, Canada's two railways made the first move towards a national consciousness of 4-H club work by sponsoring trips to the Royal Agricultural Winter Fair. These trips were popular and successful, but the need emerged to coordinate the efforts of each part of the country. Steps were then taken to form a national organization.

In 1930, the Hon. Robert Weir, federal Minister of Agriculture, called a group of 4-H supporters together, including representatives from both the federal and provincial departments of agriculture and the two railways, to discuss 4-H in Canada. CDA's representatives at the meeting were George B. Rothwell and George Clark. In 1931, this group organized what is known today as the Canadian Council on 4-H Clubs. The Council was formally incorporated in 1933. Four Agriculture Canada employees have served as president of the Canadian Council on 4-H Clubs: R. S. Hamer, Director-General, Production and Marketing, 1934; A. W. Peterson, Director, Livestock Division, 1945; E. F. Pineau, Associate Chief, Livestock Division, 1953; and D. B. Young, Assistant Chief, Markets and Merchandising, Livestock Division, 1965.

Federal-provincial Cooperation

The provincial departments of agriculture generally have responsibility for administering 4-H. However, Alberta, Saskatchewan and Newfoundland are exceptions. Responsible bodies in Alberta and Newfoundland are the Department of Culture, Youth and Recreation, and the Department of Rehabilitation and Recreation respectively. In Saskatchewan, 4-H activities are organized under the Cooperative Extension Program and administered by the University of Saskatchewan. In both Saskatchewan and Alberta, the departments of agriculture act in an advisory capacity and work directly with the program at the community level.

Although Agriculture Canada is not directly responsible for administering the 4-H program in Canada, the department does provide extensive financial and human resources to the program. Financial assistance from Agriculture Canada to 4-H in Canada amounts to over $350,000 annually. Agriculture Canada is a member of the Canadian Council on 4-H Clubs, which coordinates 4-H at the national and international level. The Council's membership is comprised of the federal government, the 10 provincial governments and over 70 business firms and associations. Each member has a representative on the

Council's Board of Directors. Agriculture Canada's representative on the Board of Directors is W. G. Robinson, Chief Registration Officer, Livestock Division, Production and Marketing Branch; he is also a member of the executive committee of the Council. Through Mr. Robinson, Agriculture Canada has a direct input into coordinating and directing 4-H at the national level. Agriculture Canada presently grants the Canadian Council on 4-H Clubs $26,500 annually for national 4-H programs, promotional activities and administration costs.

Agriculture Canada also supports 4-H at both the provincial and club level with an annual grant of $180,000. This grant is divided into four areas for allocation to the provinces as follows: 4-H club achievement awards and prize ribbons; 4-H club supplies which includes club record and project record books; 4-H club provincial award competitions; and leadership training activities, which includes the travel and living expenses for voluntary adult leaders, junior leaders, senior 4-H club members and resource people attending leadership training programs, and teaching aids utilized at leadership training programs. In 1972-73, the provinces utilized 55.5 percent of the grant for 4-H achievement awards and prize ribbons, 3 percent for supplies, 8.1 percent for provincial award competitions and 33.4 percent for leadership training.

Each year, rural young people participate in junior activity competitions at Class A and B fairs across Canada. In 1972 Agriculture Canada granted $116,448 to these fairs for rural youth inter-club activities which are usually held in the form of judging competitions, demonstrations, public speaking, and thematic displays. The majority of the youth participating in these competitions are 4-H members.

Being selected to participate in a national 4-H program represents a high point in a member's career, offering further opportunity for personal development. The traditional Agriculture Canada 4-H banquet for members attending National 4-H Conference in Ottawa has, since 1973, been replaced by a department sponsored banquet at National 4-H Citizenship Seminar. Every April, a 4-H delegate from each province was given a tour of Ottawa prior to joining 240 American 4-H'ers to participate in the United States National 4-H Conference in Washington, D.C. In the past, Agriculture Canada sponsored a send-off banquet for these delegates in addition to department officials conducting a tour for members of the nation's capital.

Many Agriculture Canada specialists act as resource people to 4-H clubs throughout Canada by serving as guest speakers, judging at competitions, providing specialized information, and conducting tours through Research Stations. Some department employees volunteer their services as adult 4-H leaders and many employees have themselves been 4-H members.

4-H in Today's Setting

The original thrust of the 4-H program was the improvement and development of agricultural methods. Since most of the members were likely to remain on the farm once they reached adulthood, the potential impact of 4-H activities on the agricultural industry was readily apparent. In recent decades, however, both the number of farms in Canada and the farm population have declined dramatically. As a result, the proportion of Canada's population residing on farms had dropped from 20.8 percent in 1951 to 6.9 percent in 1971.

Consequently, most farm and rural youth now seek their livelihood off the farm. Clearly the challenge in recent years has been to design a 4-H program to serve rural youth who now have widely divergent needs and interests, and who have a keen desire to participate in decisions likely to affect them. While the 4-H program remains deeply rooted in agriculture and retains its original high ideals, the major emphasis is now on the development of the individual participant as a responsible member of society. ■

The fun and fellowship of belonging to 4-H helps to develop young people as responsible members of society.

TABULATING CANADA'S PLANT POTENTIAL

ROLAND LOISELLE

Les variétés à fort rendement qui ont contribué au succès de la ''révolution verte'' relèguent au second plan les variétés anciennes ou primitives et détruisent ainsi la diversité génétique essentielle à l'amélioration des nouvelles variétés. L'expédition canadienne de prospection de l'avoine a fourni de bonnes sources de résistance à la maladie. Le Canada élabore présentement un programme national d'enregistrement, de conservation et d'utilisation des ressources génétiques végétales du pays.

We all have heard of the 'green revolution' and its benefits to mankind in bringing higher yielding crops and alleviating food shortages. However, the supervarieties that are responsible for the success of the green revolution also are affecting the delicate balance of nature by supplanting or smothering the ancient or primitive varieties. The new varieties are destroying their own genetic base and are becoming dangerously exposed to catastrophes such as worldwide disease.

Most of the important agricultural crops grown in Canada originated from Europe or Asia. We are fortunate that most genetic material is not in imminent danger of extinction. There are exceptions, however, such as sources of red pine in Ontario, Douglas fir in British Columbia and certain varieties and sources of early corn and alfalfa. Nevertheless, the encroachment of urban centres in geographically restricted areas; changes in ecological sites; alterations in flora resulting from extensive forest harvesting operations or strip mining; or other activities of men intensify the risk of complete loss or drastic reduction of natural plant populations.

Genetic Diversity and Plant Introductions

Although the situation in Canada is not as serious as in many countries, we are affected by the rapid erosion of germ plasm in the centers where our major crops originated. Historically, introductions from these areas have played a major role in providing the variation and genetic diversity required by plant breeders to develop new varieties adapted to the changing environments. It is in Canada's best interests to save the extremely valuable germ plasm that is left. Canada should organize and support collection expeditions in the areas of the world where genetic diversity is no longer secure.

Canada has sent a few expeditions to collect land races and wild species of oats in the past 10 years. This has yielded very valuable material. Eighteen oat species were collected in the various Canadian oat collecting expeditions and three new species *(Avena magna, A. damascana, A. canariensis)* have been discovered as a result of these explorations. Canada now has the largest world collection of wild species of the genus Avena. Some of this material has provided good sources of disease resistance.

It is known that an enormous wealth of variation was created as crops migrated from areas where they were domesticated, thus diversifying under the impact of different environments and cultures in the areas of migration. Only a small proportion of that enormous wealth of variation has been absorbed so far in the breeding of modern crop varieties.

Over the years Canadian plant breeders and other plant scientists have introduced much material as a result of seed exchanges with many countries. This is still a good source of genetic material today. A survey conducted a few years ago showed that 179 individuals or institutions maintained over 86,000 stocks (Table 1)—1,000 stocks more than those reportedly maintained by the US National Seed Storage Laboratory. Admittedly, not all stocks represent introductions, but introductions certainly represent the bulk of this material.

Forage introduction nursery at the Ottawa Research Station.

Dr. Loiselle is head of the Central Office for the Plant Gene Resources of Canada, Ottawa Research Station, Agriculture Canada, Ottawa, Ontario.

TABLE 1 NUMBER OF GENETIC STOCKS MAINTAINED IN CANADIAN COLLECTIONS FOR A SELECTED GROUP OF CROPS—1971.

Crop	Number of collections	Total number of stocks
Alfalfa	18	3,100
Apple	8	950
Barley	20	6,000
Bean	3	110
Bentgrass	3	360
Birdsfoot trefoil	7	1,350
Bluegrass	6	1,300
Brome	7	650
Buckwheat	2	225
Corn	10	2,800
Cucumber	2	25
Currant	2	50
Fababean	1	100
Fescue	5	780
Flax	4	1,900
Grape	3	300
Oat	21	12,900
Orchardgrass	4	150
Peach	2	400
Pear	7	75
Pelargonium	2	125
Pepper	1	100
Potato	3	1,000
Plum	5	440
Pumpkin, squash	1	50
Raspberry	5	1,200
Reed canarygrass	3	250
Rhubarb	1	10
Rye	5	300
Soybean	3	950
Strawberry	5	5,330
Sweetclover	3	375
Timothy	3	345
Tobacco	1	25
Tomato	14	10,350
Triticale	1	200
Wheat	28	9,100
Wheatgrass	8	1,200
Wild rice	2	45
Wild ryegrass	6	340

Canadian Program

It is only recently that concerted efforts have been made to establish a national program to take inventory, describe, preserve and fully utilize the plant genetic resources of the country, particularly those maintained in Canadian collections. This action came as a result of discussions between representatives of federal and provincial governments, universities, interested scientific societies and other concerned individuals. A Canada Committee on Plant Gene Resources was established in 1971 to provide general direction and set priorities in connection with the 'recording, utilization and conservation' of Canadian plant genetic resources. The Central Office for the Plant Gene Resources of Canada, created by the Research Branch of Agriculture Canada in the fall of 1970, is responsible for the day to day operations of the program.

Computerized Information

The main objective of the Central Office is to produce a fully documented catalogue or inventory of the plant gene resources of the country and of other countries if they relate to Canadian requirements. The catalogue will contain all the information available on pedigrees, synonymy, origin, agronomic or horticultural data, insect and disease reactions, morphological characteristics, etc. This information on Canadian genetic resources is to be obtained from breeders and other plant scientists who have the material in their collections.

A data system for the recording of the information on stocks in Canadian collections has been developed by the Central Office. Efforts are concentrated at present on three crops; barley, tomato and alfalfa. Since a different type of information is recorded for each crop this has necessitated the development of individual crop information forms. These were designed in such a way that the information, when completed, can be transferred readily to computer cards and then on tapes for computer processing. The computer system will be used to produce catalogues, on a crop basis, of the plant gene resources of Canada. In addition, it will permit the creation of crop data banks to provide a 'query service' to plant breeders and others for locating stocks combining specific characteristics or possessing certain attributes which will be used in breeding or research programs.

Preservation of Genetic Resources

The fact that a genetic stock is present in a collection today does not ensure that it will be preserved. Its maintenance can be affected by many factors such as changes in research and breeding programs, retirement or transfer of personnel, loss of seed viability, destruction by fire or other hazards. At present only limited facilities are available at the Central Office for long-term seed preservation. Small seed samples of all stocks listed in the Canadian catalogues of plant gene resources will be stored by the Central Office to ensure that this material is not lost and that it will be available for future plant breeding programs.

The conservation of vegetatively propagated material, e.g. fruit trees, potatoes, some ornamentals, etc., presents greater difficulties than that of seed propagated material. Maintenance of vegetatively propagated genetic resources should be in the areas where they are commonly grown. It has been proposed that one or more institutions located in favorable areas be given the responsibility of maintaining these.

The Plant Gene Resources program will help to preserve the variation and genetic diversity required by plant breeders to develop new varieties. With more information available, Canada's gene resources will be more fully utilized. ■

MANAGEMENT OF APPLE PESTS...

... PRESENT STATUS IN NOVA SCOTIA

K. H. SANFORD and R. L. HORSBURGH

Les recherches sur la dynamique de la faune des vergers, effectuées par les entomologistes du ministère fédéral de l'Agriculture de la Station de recherche de Kentville, et par les spécialistes en arboriculture du ministère de l'Agriculture et des marchés de la Nouvelle-Écosse, ont permis aux arboriculteurs de la vallée d'Annapolis de mettre au point un programme de lutte intégrée, qui tire le meilleur parti possible des agents naturels et chimiques.

Pest control in orchards in the Annapolis Valley of Nova Scotia for the past 30 years has been based on the premise that beneficial species should be allowed to exercise their maximum potential in the control of pest species. Basic to this has been detailed research on the ecology and dynamics of both pest and beneficial species, and also the role of the chemical additives in the spray program.

When components of the orchard fauna were known through research, and additional chemicals were available with known specific qualities, greater use was made of beneficial species in the control of a wider range of pest species. At this stage an integrated control program for orchard pests became widely accepted and has continued to be practiced at different levels by most growers.

Mr. Sanford is a research scientist, Entomology, CDA Research Station, Kentville, Nova Scotia. Dr. Horsburgh is a former tree fruit specialist with the Nova Scotia Department of Agriculture. He is presently associate professor, Virginia Polytechnic Institute, Virginia, U.S.A.

Apple Fauna

The pest and beneficial fauna of Nova Scotia orchards does not differ greatly from other areas. Many pest species in Nova Scotia have only one generation a year while, in other apple producing areas, the same species may have two or even three generations a year. This fact favors the Nova Scotian control program over other areas. Some of the pests have been introduced. One of these, the wintermoth, requires chemical controls almost annually since parasitism is not sufficient to keep it below economic levels. Another imported pest, a stinging bug, *Atratotomus mali* Meyer occasionally requires treatment.

Codling moth, budmoth, rosy apple aphids and phytophagous mites respond to pest management and do not require annual treatments. Apple maggot is the worst pest since there are no predators or parasites working against it. Chemical controls combined with sound cultural management practices are almost an annual necessity to keep it in check. Tent caterpillars, fruitworms, apple sucker, stinging bugs and leafhoppers are occasional pests. When they get numerous the controls directed at important pests can be selected and timed to reduce the minor pests.

Many potential pests are part of the orchard fauna and occasionally cause trouble when released from natural controls. Oystershell scale, Lecanium scale, mealy bugs and leafrollers are kept low by natural factors.

The predacious fauna is rich in numbers of species and predation pressures exist throughout the growing season. Fourteen species of Miridae, predacious on mites and also on a number of insect pests, form the major group. Anthocorids, thrips, lady bird beetles, aphid lions and many species of parasites round out the beneficial insect group, which exercise some control on pest species if they are present. In addition, a large group of predacious mites assist in the control of plant feeding mites. Fourteen species of Phytoseiidae have been recognized. Predacious mites belonging to the families Stigmaeidae, Bdellidae, Trombidiidae, Anystidae and Cheyletidae are also present.

Chemical Controls

Prior to the development of the many broadly toxic pesticides used in orchard management today, selective chemicals were found and used in our spray program. These, together with the assistance of beneficial species, provided adequate control of the pest species but allowed some fruit injury and rather large pest and predator population fluctuations.

(Top left) Leaf roller injury on apples.
(Top) Lady bird beetle larvae, an important predator of aphids.
(Middle) Oyster shell scale showing exit holes caused by emerging parasites.
(Bottom) A mirid predator, *Deraeocoris fasciolus* Knight feeding on its prey.

A group of stink bug nymphs preying on a winter moth larvae.

With these selective chemicals good orchard pest control was achieved for a number of years particularly during the 1950's and early 1960's. During the late 60's codling moth populations increased and growers became disenchanted with the selective material ryania because it did not prevent injury to the fruit as well as desired. Apple maggot became heavy and abandoned orchards provided reservoirs for flies. Lead arsenate did not prevent flies from flying into an orchard and laying eggs although it is effective on populations living within the orchard itself.

These two problems initiated the use of more broadly toxic chemicals in problem orchards. Where these have been used, predator populations have been drastically reduced. In some cases, phytophagous mites have increased but a single application of a selective miticide corrects this. These toxic chemicals are now used only to correct problems and rarely are treatments necessary in the succeeding year. Because of this, major pests and beneficial species are brought to low levels and then the fluctuations in both populations continue at much lower levels. The management of codling moth and apply maggot populations has been enhanced by the use of pheromone and other monitoring traps. Selective controls are employed for other minor pests, and regulation without the use of excessive amounts of chemicals is thus possible. Resistance is not a problem in our orchard pests and with the use of minimal amounts of chemical, environmental quality is maintained and the control program remains economical.

Management and Extension

The basic tools of pest management, utilizing the best of natural and chemical controls include: (1) knowledge of the biology and habits of both the pest and beneficial species in the orchard; (2) knowledge of the action of spray chemicals on each species, both pest and beneficial; and (3) ability to extend this knowledge to the grower so that he may practice the control program wisely.

In Nova Scotia, the research program has provided biological information on the orchard fauna, identification, injury assessment, predator values and some economic thresholds or pest levels together with the effects of most spray chemicals on both pest and beneficial species. This has been incorporated into the spray program.

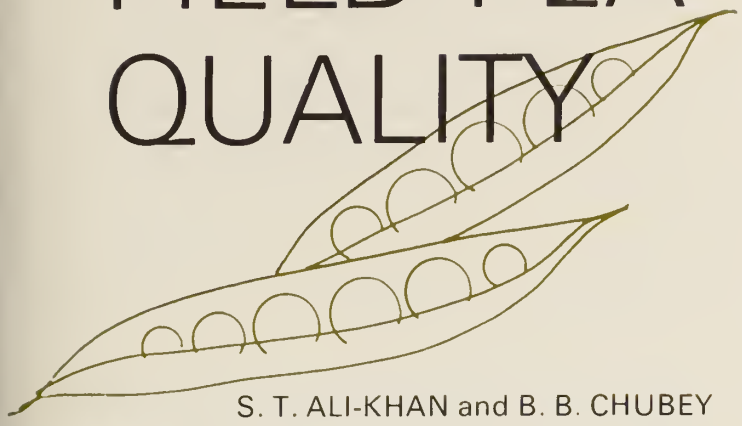
At least 90 percent of the growers practice pest management to some degree although, of course, some are more proficient and adept than others. Close cooperation between the Nova Scotia Department of Agriculture and Marketing, extension personnel and the C.D.A. research scientists has greatly facilitated this. Growers have learned to recognize the major orchard pests in their various life stages, and are aware of principal predators and that they are beneficial members of the orchard insect complex. All growers receive the spray guide which contains two spray calendars, one an integrated control program and the other a chemical control program.

During the growing season, a weekly meeting is held at which both Federal and Provincial personnel, concerned with tree fruit work at the Kentville Research Station, present their observations. Based on the findings and recommendations of this group a leaflet, ''The Orchard Outlook'', is prepared and distributed. The function of this circular is to acquaint growers with the situations they are likely to encounter during the next week and to advise them of the remedial action to take if necessary. Problems of pest population estimation, fertility levels, spray thinning, weed control, pruning, harvesting dates and hints, disease recognition and control are a few of the topics that are routinely covered.

During the winter, growers are given an opportunity to discuss their specific orcharding problems with the appropriate scientists and extension specialists. An overall basic production plan is tailored to each specific situation. This individual consultation service has greatly favored pest management in Nova Scotia. By studying past records, ''crisis situations'' can often be foreseen and avoided without the use of unduly disruptive chemical control. If an insecticide application of pesticide is required to suppress a pest population that has exceeded the economic injury level, the growers have learned to average the cost of the treatment over several seasons. This is possible because the treatments recommended do not totally eliminate beneficial species. Consequently, they maintain the pest population at a low level for a few years after the outbreak peak has been reduced.

Full preventive insecticide spray programs have not been practiced in Nova Scotia for over 30 years. The judicious use of chemicals in a corrective manner has always been recommended. Close cooperation between research and extension personnel has greatly enhanced this. With the newer chemicals utilized in a selective manner, controls for specific pests are possible. This is resulting in an even lower total load of pesticides being introduced into the orchard environment. ■

FIELD PEA QUALITY



S. T. ALI-KHAN and B. B. CHUBEY

Les chercheurs de la Station de recherche de Morden sélectionnent des variétés améliorées de pois secs résistant aux maladies et possédant de bonnes qualités culinaires. Ces dernières comprennent la couleur de la soupe, les propriétés d'absorption d'eau, la tendreté, la granulation des particules d'amidon, la viscosité de la purée et la saveur. La sélection à l'égard des qualités culinaires doit être combinée avec des rendements élevés, la résistance aux maladies, le diamètre des grains et la couleur.

In Canada, the commercial use of field peas is mainly by the soup industry. Dry peas either are canned as soup or packaged as whole or split peas for domestic consumption. In England, dry peas are processed as whole peas while in developing countries, where peas are an important source of protein in the human diet, they are regularly used in soups, boiled rice dishes, curried preparations and snacks. Recently, the Prairie Regional Laboratory at Saskatoon found that protein concentrates obtained from dry peas contained as high as 60 percent protein, possessed good flavor and had other desirable characteristics for use in snack and health foods.

Manitoba is the major Canadian production area for field peas and extensive research on this crop is carried out at the Agriculture Canada Research Station, Morden, Manitoba. The main features of the Morden program are breeding improved varieties, which are resistant to diseases and possess good cooking quality, and investigating field management practices.

Quality in field peas generally refers to cooking quality or the quality of the soup. As in other crops, the quality of peas is a complicated characteristic and consists of a number of parameters such as color of the soup, water soaking properties of peas, degree of tenderness of cooked peas, granulation of starch particles, viscosity of the puree and flavor. It has become evident that these parameters are affected by a number of interacting factors.

Color of peas or cotyledons is an important characteristic. Basically, the color of cotyledons in mature peas is either yellow or green, but within these two categories a number of shades exist. In Canada, yellow-seeded peas are more popular than green-seeded peas. Since artificial coloring cannot be used in pea soups in Canada, selection for color in breeding new varieties is important.

A bright yellow pea soup is preferred by the Canadian consumer. To obtain this color in the finished product, field peas need to have a golden-yellow color. Our observations on color, using the Hunter color and color difference meter, show that peas with a reddish tint produce a good yellow soup. Greyish colored soup is considered low quality. In green peas, a good natural green color is desirable. Peas with light green or yellowish-green cotyledons are of low quality.

Cooking Qualities

Peas that readily soak up water and become tender after boiling for a set period of time are considered soft cookers. Those peas which remain hard are classified as hard cookers. This is a complex property affected by factors such as thickness of seed coat, absorption capacity and chemical composition of cotyledons. Also, genetic differences in cooking quality exist in peas. The cookability of peas is positively related to the phosphate content of the seed. Peas with a high phosphorus content and high phytin (inositol phosphoric acid) content indicate good cooking quality. In addition to the chemical composition, the maturity of peas is also an important factor as immature peas are generally poor cookers.

Texture and consistency of the puree after cooking is closely related to cookability. Texture is referred to as granulation, meaning the tendency of starch granules to stay together or break part after cooking. Granulation is important to those manufacturers who produce a ''ready to serve'' product because only a limited amount of breakdown of peas is required. In manufacturing condensed or dehydrated soups, complete breakdown is important. However, peas with good cookability are important in any type of product.

In developing new varieties of field peas the importance of cooking quality cannot be overemphasized. Selection for cooking quality is difficult because it must be combined with high yields, disease resistance, seed size, color, etc. It appears that the solution for quality in peas lies in the processing techniques. A chemical or physical process which would improve cookability of hard cooking peas would be beneficial to growers, processors and consumers. ■

Dr. Ali-Khan is a plant breeder and Dr. Chubey is a food quality specialist of the CDA Research Station, Morden, Man

CALCIUM DIP PREVENTS SPARTAN APPLE BREAKDOWN

J. L. MASON, J. M. McDOUGALD
and B. G. DROUGHT

Les Spartan sont affectées certaines années d'un grave blettissement d'entrepôt pouvant causer des pertes allant jusqu'à 3 millions de dollars en Colombie-Britannique. On a mis au point des bains de chlorure de calcium qui empêchent le blettissement par l'augmentation de la teneur en calcium de la pomme. Le fruit absorbe d'autant plus de calcium qu'on ajoute des épaississants à la solution. La teneur en calcium peut être augmentée pour éliminer virtuellement le blettissement.

In some years, the Spartan apple develops a type of flesh breakdown during the storage season. In 1969, half the fruit placed in storage were lost. The Spartan crop in British Columbia exceeded 1,000,000 bu. in 1973 and the economic loss on such a crop could reach $2 to $3 million in a single season. At the Summerland Research Station, we developed procedures to prevent breakdown in Spartan apple.

In earlier work we established that breakdown is associated with low calcium levels in the fruit. We also demonstrated that a summer-long calcium spray program will reduce breakdown to minimum levels. However, such a spray program represented a considerable effort by the fruit grower. Simpler systems were needed.

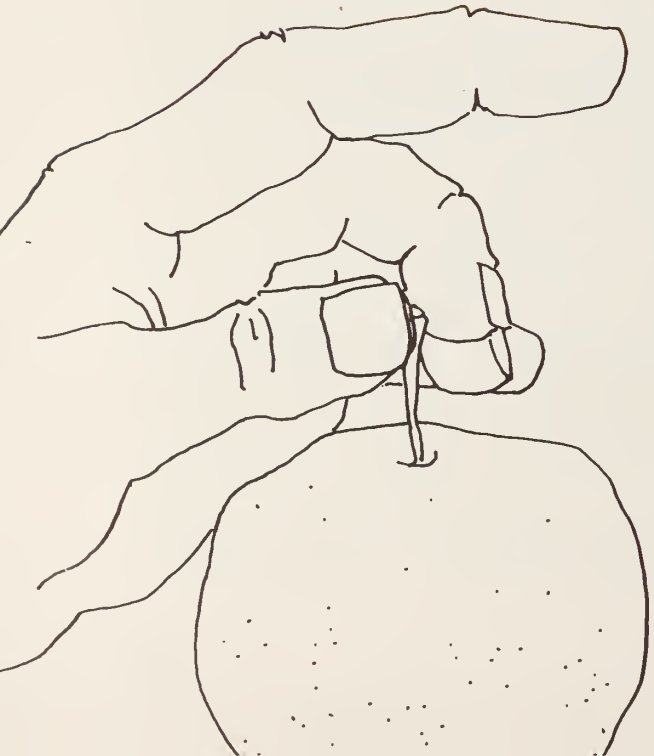
We have now developed dip procedures which are cheap and easy to use. Nine hundred lb bins of apples moved by lift trucks are dipped on receipt at the packing-house, avoiding any special handling by the grower. The cost is about 65¢/bin or 2.6¢/bu.

Commercial calcium chloride dissolved in water is used for the dip solution at 40 lb/100 Imperial gal of water. This solution is sluiced through the apples in the bin and drains out through holes in the bottom. The bin is left to drain for some time before being moved into the cold storage. This process is carried out as soon as the bin arrives at the packing-house from the orchard.

The flesh of dipped apples contains about 80 ppm more calcium than undipped apples. If the fruit has a natural level of 170 ppm calcium, then after dipping it will have 250 ppm at the end of the storage season.

In comparison with this dip procedure, the spray program was less effective. Apples receiving the spray program contained about 30 ppm more calcium than unsprayed apples. The amount of work involved in spraying was also much greater.

The latest development in the dip process is the addition of thickeners to the dip solution. With thick-



Dr. Mason is Head and Mr. McDougald and Mr. Drought are Technicians, Soil Science Section, CDA Research Station, Summerland, B.C.

eners added, more of the solution adheres to the apple, reducing the incidence of breakdown.

Thickeners in a dip solution have proved remarkably effective in increasing the quantity of calcium moving into the flesh of the apple. In one recent experiment, the untreated fruit had a concentration of 204 ppm calcium in the flesh, while fruit dipped in 4 percent calcium chloride had 282 ppm calcium. With arrowroot thickener added to the drip solution, the fruit had 421 ppm calcium and with Kelzan thickener, it had 634 ppm calcium. Kelzan is a commercial product, but not registered for food use. A more highly refined product, Keltrol, is registered and used for thickening such products as commercial pie fillings.

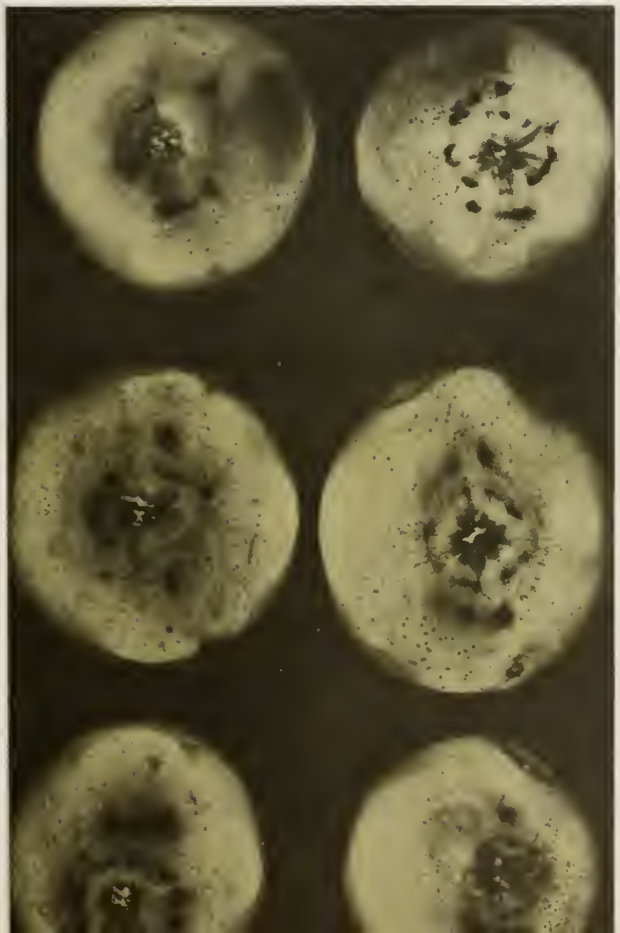
The large increases in calcium concentration of apple flesh achieved with a dip containing thickener show great promise not only for reducing the incidence of breakdown but also for essentially eliminating the problem. Some packing-houses have carried out extensive dip programs during the past 2 years on their commercial Spartan apples.

There is one disadvantage arising from the dip. A few fruits develop a burn in the calyx-end (blossom end or bottom) of the fruit and have to be culled. The losses are not great in any one lot and relatively few lots are affected. We will attempt to modify the dip process to eliminate this loss.

Following the dip process, the calcium chloride solution covers the skin of the fruit and the calcium then moves through the skin into the flesh. We followed this movement over a period of time in fruit dipped in 4 percent calcium chloride without thickener and found increases in calcium concentration at depths up to 5 mm in 2 weeks, up to 7.5 mm in 4 weeks, and up to 20 mm (right to the core) in 8 weeks.

The concentration of calcium in the apple flesh was still increasing 16 weeks after the dip. The increase in calcium in the dipped fruit over the undipped fruit was about 80 ppm at the 2.5 mm depth from the skin and graded down to 45 ppm at the 20 mm depth near the core of the apple. ■

Outside appearance of Spartan fruit, normal fruit in the left row, breakdown fruit in the right row.



Inside appearance of Spartan fruit with breakdown, mild on the top, moderate in the centre, and severe on the bottom.

NITROGEN ON BROMEGRASS FOR PRODUCTION EFFICIENCY

A. T. H. GROSS

Dans une série d'essais échelonnés sur 3 ans, des chercheurs de la Station de recherche de Brandon ont étudié les effets de l'azote sur la production du brome. Au cours de ces études, on a constaté que la teneur en azote nitrique ne s'établissait en moyenne, seulement qu'à 8.4 livres (3,8 kg) à une profondeur de 2 pieds (60 cm). Les trois études ont révélé que la fumure azotée a permis d'accroître les rendements ainsi que les revenus.

Forage crops are basic to expanding world red meat production. They are also basic to conservation of our soils and the environment. To use forages effectively, we must grow the best adapted and most productive crops and manage them efficiently.

Bromegrass, one of the most widely adapted forage grasses in Canada, is long-lived and productive when properly managed. Like all grasses, it requires nitrogen fertilizer to ensure good production and maintenance of a healthy sward. For those reasons it is being used in a series of studies on nitrogen for production and efficiency at the Brandon Research Station.

Production

To support the use of fertilizer on forage crops, tests were run on clay loam soil, which, after 80 years of cropping, had declined in natural fertility.

Mr. Gross is a forage evaluation and management specialist at the CDA Research Station, Brandon, Manitoba.

During 3-years of our nitrogen studies, the nitrate nitrogen content averaged only 8.4 lb to a 2-ft depth of soil. The three studies indicated improved production from use of nitrogen fertilizer.

In one series of tests, new stands of bromegrass were fertilized annually in the spring starting in their first year of production. Yields were increased, giving a good return on the fertilizer investment. During 3 years of this study, the unfertilized grass averaged 4620 lb/ac, whereas the fertilized grass averaged 7100 lb i.e. 2480 lb more. This increase was equal to 16.5 lb of hay for each pound of fertilizer nitrogen applied. To illustrate this, when hay costs $20, $30 or $40/ton, i.e. 1¢, 1.5¢ or 2¢/lb, nitrogen, which costs less than 16.5¢ 24.75¢ or 33¢/lb, would be a profitable investment. Benefits of improved hay protein content resulting from the use of fertilizer would be a bonus.

In a second series of tests, bromegrass stands, 1 to 6 years old, which had not previously been fertilized, were fertilized annually for 3 years when they were 3 to 8 years old. All ages of stand responded well to the nitrogen fertilizer. The unfertilized grass averaged 2130 lb/ac, and the fertilized grass averaged 5330 lb/ac, i.e. 3200 lb more. This increase was 21.3 lb of hay for each pound of fertilizer nitrogen applied. Thus, the older stands, which had not previously been fertilized, gave an even greater increase in yield and profit than was realized from the new stands.

The third series of tests was similar to the second series. The bromegrass stands, 1 to 6 years old, which had not previously been fertilized, were treated once only and yields were recorded for three subsequent years to determine the residual effects from nitrogen fertilizer. There was a substantial increase in yield in the year the fertilizer was applied, but there was little yield benefit in subsequent years. The unfertilized grass averaged 2030 lb/ac during the 4-year study. The fertilized grass totalled 4460 lb more, i.e. 3410 lb more in the year of fertilizing, and 830,200 and 20 lb more, respectively in the first, second and third-year after fertilizing. Thus over the 4-year period the hay yield increase per pound of fertilizer nitrogen applied was 24.0 lb in the year of application, and 5.1, 0.8 and 0 in the first, second and third-year after fertilizing. It is evident there is a rapid decline in residual effects of nitrogen on bromegrass. This is even more significant since our average rate of application was 150 lb of nitrogen/ac and that rates were as high as 225 lb/ac.

There was no appreciable nitrogen carryover in the soil. The residual nitrogen in the soil in the fall averaged 9 lb/ac in the top 2 ft from the 225 lb/ac rate of nitrogen applied annually for 3 years. There was no evidence, therefore, that there was nitrogen build-up in the soil from rates 100 percent above present levels of recommendation for forage crop production in Manitoba.

TABLE 1 EFFECT OF NITROGEN FERTILIZER ON BROMEGRASS YIELDS

Fertilizer	Yield lb/ac		
lb/ac	new stands[1]	old stands[1]	old stands[2]
	1971-1973	1970-1972	1969-1972
0	4620	2130	2030
150-0-0	7100	5330	3145
Increase[3]	16.5	21.3	29.9

[1] Fertilized annually.
[2] Fertilized in 1969 only
[3] Lb dry matter per lb nitrogen applied

The bromegrass on the left received 75 lb of nitrogen/ac while the plot on the right was not fertilized. Both plots were established in 1966.

Continuing Research

Studies are underway at the Brandon Research Station to compare the response of other grasses to nitrogen with those of bromegrass. Protein studies are revealing improvement in feed quality from use of fertilizers; this area of investigation is continuing. Fertilizing legumes and grass-legume mixtures are being evaluated for both quantity of forage and quality of feed.

The effects of fertilizing are long-range and complex due to the perennial nature of the crops and the ecology of the plant-soil relationships involved. The nutritional interactions in the plant-animal-man chain increases the complexity because the forage crop is consumed by animals which provide a substantial part of the protein supply for man. ■

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IF UNDELIVERED, RETURN TO SENDER EN CAS DE NON-LIVRAISON, RETOURNER À L'EXPÉDITEUR

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